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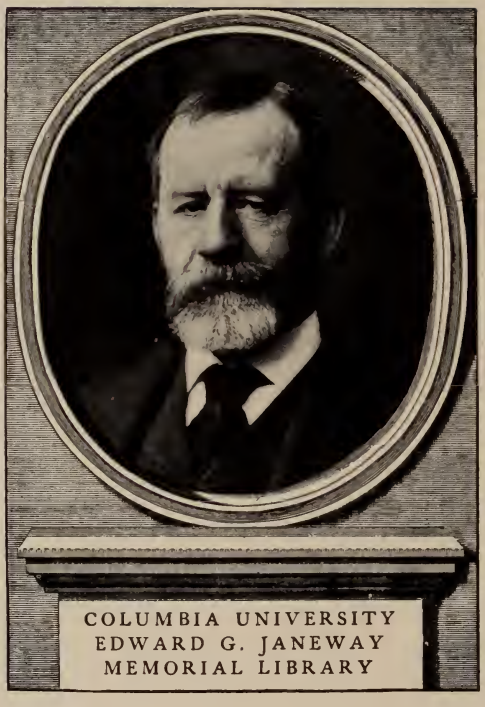

TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

FOR THE YEAR 1897.

VOLUME XIII.

PHILADELPHIA:
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1897.

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GUY HINSDALE, M.D., Secretary of the Association.

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VOL. XI. contains a complete Index of 11 volumes.

VOL. XII. contains Constitution and By-laws and a list of all past members.

DORNAN, PRINTER.

OFFICERS OF THE ASSOCIATION, 1897.

President.

E. FLETCHER INGALS, M.D., Chicago.

Vice-Presidents.

SAMUEL A. FISK, M.D., Denver.
JOHN C. MUNRO, M.D., Boston.

Secretary and Treasurer.

GUY HINSDALE, M.D., Philadelphia.

Council.

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ISAAC HULL PLATT, M.D., Lakewood.
S. E. SOLLY, M.D., Colorado Springs.
JAMES B. WALKER, M.D., Philadelphia.

Representative to the Executive Committee of the Congress of American Physicians and Surgeons.

FREDERICK I. KNIGHT, M.D., Boston.
ROLAND G. CURTIN, M.D., Philadelphia, *Alternate.*

OFFICERS OF THE ASSOCIATION, 1898.

President.

E. O. OTIS, M.D., Boston.

Vice-Presidents.

BEVERLEY ROBINSON, M.D., New York.
C. F. McGAHAN, M.D., Aiken, S. C.

Secretary and Treasurer.

GUY HINSDALE, M.D., Philadelphia.

Council.

ROLAND G. CURTIN, M.D., Philadelphia.
ISAAC HULL PLATT, M.D., Lakewood.
S. E. SOLLY, M.D., Colorado Springs.
JAMES B. WALKER, M.D., Philadelphia.
E. FLETCHER INGALS, Chicago.

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LIST OF OFFICERS.

Presidents.

Name.	Year.
A. L. Loomis	1884–5.
William Pepper	1886.
Frank Donaldson	1887.
A. L. Loomis	1888.
V. Y. Bowditch	1889.
Charles Denison	1890.
F. I. Knight	1891.
W. E. Ford	1892.
R. G. Curtin	1893.
A. H. Smith	1894.
S. E. Solly	1895.
J. B. Walker	1896.
E. Fletcher Ingals	1897.
E. O. Otis	1898.

Vice-Presidents.

F. I. Knight, W. H. Geddings	1884–5.
Frank Donaldson, Beverley Robinson	1886.
V. Y. Bowditch, R. G. Curtin	1887.
A. Y. P. Garnett, J. T. Whittaker	1888.
J. R. Leaming, E. T. Bruen	1889.
A. L. Gihon, H. B. Baker	1890.
E. L. Trudeau, T. S. Hopkins	1891.
E. Fletcher Ingals, Beverley Robinson	1892.
A. H. Smith, E. O. Otis	1893.
I. Hull Platt, E. L. Trudeau	1894.
John H. Musser, G. R. Butler	1895.
Charles E. Quimby, James A. Hart	1896.
S. A. Fisk, John C. Munro	1897.
Beverley Robinson, C. F. McGahan	1898.

Secretaries and Treasurers.

James B. Walker	1884–95.
Guy Hinsdale	1895–98.

LIST OF MEMBERS.

Honorary Members.

ELECTED

1890. Stillé, Alfred, 3900 Spruce Street, Philadelphia.
1897. Weber, Hermann, 10 Grosvenor Street, W., London, England.
1897. Williams, Charles Theodore, 2 Upper Brook Street, W., London.

Active Members.

1888. Abbot, Griffith E., 13½ Street and Pennsylvania Avenue, Washington, D. C.
1893. Abbott, A. C., Laboratory of Hygiene, Univ. of Penna., Philadelphia.
1897. Alden, C. H., Assistant Surgeon-General, U. S. A., Washington, D. C.
1890. Allen Harrison, 1933 Chestnut Street, Philadelphia.
1897. Alton, Charles D., Hartford, Conn.
1889. Anders, J. M., 1605 Walnut Street, Philadelphia.
1890. Anderson, B. P., Colorado Springs, Col.
1890. Atkins, Francis H., Las Vegas, N. M.

1893. Babcock, R. H., 103 State Street, Chicago.
1885. Baker, Henry B., 726 Ottawa Street, Lansing, Mich.
1885. Bell, A. N., 337 Clinton Street, Brooklyn.
1896. Bergey, David H., Laboratory of Hygiene, Univ. of Penna., Philadelphia.
1896. Bernardy, E. P., 221 South 17th Street, Philadelphia.
1897. Billings, Frank, 235 State Street, Chicago.
1897. Blackader, Alexander D., 236 Mountain Street, Montreal, Canada.

ELECTED

1895. Boardman, W. S., 57 Hancock Street, Boston.
1897. Bonney, S. G., 726 14th Street, Denver.
1884. Bosworth, F. H., 26 West 46th Street, New York.
1885. Bowditch, V. Y., 506 Beacon Street, Boston.
1895. Brandt, C. N., Hot Springs, Va.
1891. Brannan, John W., 11 West 12th Street, New York.
1896. Bratton, W. D., Albuquerque, N. M.
1894. Bridge, Norman, 34 Washington Street, Chicago.
1897. Brown, Sanger, Venetian Building, Chicago.
1890. Buckley, J. J., Missoula, Mont.
1896. Bulette, W. W., Pueblo, Col.
1886. Butler, G. R., 229 Gates Avenue, Brooklyn.

1896. Campbell, W. A., 38 Bank Building, Colorado Springs.
1894. Chapin, Frederick W., Asheville, N. C., and Pomfret, Conn.
1887. Chapman, S. H., New Haven, Conn.
1894. Coleman, Thomas D., 563 Green Street, Augusta, Ga.
1889. Coolidge, A., Jr., 1 Exeter Street, Boston.
1885. Curtin, R. G., 22 South 18th Street, Philadelphia.

1892. Daland, Judson, 319 South 18th Street, Philadelphia.
1885. Daly, W. H., 135 Fifth Avenue, Pittsburg.
1897. Danforth, I. N., 70 State Street, Chicago.
1890. Darlington, Thomas, Jr., King's Bridge, New York City.
1897. Davis, N. S., Jr., 65 Randolph Street, Chicago.
1884. Denison, Charles, 823 14th St., Denver.
1897. De Witt, Calvin, Surgeon U. S. A., Fortress Monroe.
1884. Didama, H. D, 424 South Salina Street, Syracuse, N. Y.
1890. Dodge, H. O., Boulder, Colorado.
1896. Dudley, Wm. F., 149 Clinton Street, Brooklyn, N. Y.

1897. Edson, Carroll E., McPhee Building, Denver, Col.
1892. Elsner, H. L., Fayette Park, Syracuse, N. Y.
1885. Eskridge, J. T., 204 Equitable Building, Denver, Col.

ELECTED

1887. Fisk, Samuel A., 37 18th Street, Denver, Col.
1885. Ford, Willis E., 266 Genesee Street, Utica, N. Y.
1885. French, Thomas R., 469 Clinton Avenue, Brooklyn.
1897. Fütterer, Gustav, 34 Washington Street, Chicago.

1896. Gardiner, C. F., 224 Pike's Peak Avenue, Colorado Springs, Col.
1884. Garland, George M., 227 Newbury Street, Boston.
1886. Garnett, A. S., Hot Springs, Ark.
1892. Gibson, William M., 260 Genesee Street, Utica, N. Y.
1884. Glasgow, W. C., 2847 Washington Avenue, St. Louis.
1893. Gray, Landon Carter, 6 E. 49th Street, New York.

1893. Hance, I. H., Lakewood, N. J.
1896. Hare, Hobart A , 222 South 15th Street, Philadelphia.
1891. Hart, James A., Colorado Springs, Col.
1896. Heffron, John L., 448 South Salina Street, Syracuse, N. Y.
1893. Hinsdale, Guy, 3943 Chestnut Street, Philadelphia.
1885, Hopkins, Thomas S., Thomasville, Ga.
1897. Hyde, James Nevins, 34 Washington Street, Chicago.

1884. Ingals, E. Fletcher, 34 Washington Street, Chicago.

1889. Jacobi, A., 110 West 34th Street, New York.
1888. Jayne, W. A., 217 McPhee Building, Denver, Col.
1897. Johnson, Frank S., 2521 Prairie Avenue, Chicago.
1886. Johnston, W. W., 1603 K. Street, N. W., Washington.
1893. Judd, L. D., 3603 Powelton Avenue, Philadelphia.

1890. Kellogg, J. H., Battle Creek, Mich.
1884. Knight, Frederick I, 195 Beacon Street, Boston.

1887. Langmaid, S W., 373 Boylston Street, Boston.
1890. Lincoln, R P., 32 West 31st Street, New York.
1896. Loomis, Henry P., 58 East 34th Street, New York.

1894. McGahan, C. F., Aiken, S. C., and Bethlehem, N. H.
1887. Mays, Thomas J., 1829 Spruce Street, Philadelphia.

ELECTED

1891. Moore, H. B , Colorado Springs, Col.
1890. Mulhall, J. C., 3609 Lindell Avenue, St. Louis.
1889. Munro, John C., 173 Beacon Street, Boston.
1886. Musser, John H., 1927 Chestnut Street, Philadelphia.

1895. Newton, R. C., 19 North Fullerton Avenue, Montclair, N. J.
1888. Nunn, Richard J., 119 York Street, Savannah.

1884. Orme, H. S., Box 1045, Los Angeles, Cal.
1888. Otis, E. O., 308 Commonwealth Avenue, Boston.

1887. Peale, A. C , 605 12th Street, N. W., Washington, D. C.
1884. Pepper, William, 1811 Spruce Street, Philadelphia.
1893. Peterson, Frederick, 60 West 50th Street, New York.
1895. Phillips, W. F. R., Weather Bureau, Washington, D. C.
1885. Platt, Isaac Hull, Lakewood, N. J.
1887. Platt, Walter B., 802 Cathedral Street, Baltimore.

1891. Quimby, Charles E., 44 West 36th Street, New York.

1891. Ransom, C. C., 152 West 48th Street, New York (Richfield Springs).
1884. Reed, Boardman, 1831 Chestnut Street, Philadelphia.
1897. Register, E. C., Charlotte, N. C.
1885. Rice, C. C., 115 East 18th Street, New York.
1893. Risley, S. D., 1722 Walnut Street, Philadelphia.
1884. Robinson, Beverley, 37 West 35th Street, New York.
1890. Robinson, W. D., 2012 Mt. Vernon Street, Philadelphia.
1896. Rodgers, Mark A., Tucson, Arizona.
1892. Roe, John O., 28 North Clinton Street, Rochester, N. Y.
1890. Rogers, E. J. A., 222 Colfax Avenue, Denver, Col.
1889. Ruck, Karl von, Asheville, N. C.
1891. Ruedi Carl, Grand Hotel, Arosa, Switzerland.

1884. Schauffler, E. W., 1221 Washington Street, Kansas City, Mo.
1896. Schroeder, Henry H., 230 W. 135th New York City.

ELECTED

1884. Shurly, E. L., 32 Adams Avenue, West Detroit, Mich.
1890. Smith, A. Alexander, 40 West 47th Street, New York.
1885. Smith, Andrew H., 22 East 42d Street, New York.
1887. Smith, Frank Fremont, St. Augustine, Fla., and Bar Harbor, Maine.
1887. Solly, S. E., 2 North Cascade Ave., Colorado Springs, Colorado.

1892. Taylor, H. Longstreet, 494 Endicott Arcade, St. Paul, Minn.
1896. Taylor, J. Madison, 1504 Pine Street, Philadelphia.
1887. Thomas, J. Carey, 228 Madison Avenue, Baltimore.
1885. Trudeau, E. L., Saranac Lake, New York.
1884. Tyndale, J. Hilgard, 13th and P Streets, Lincoln, Nebraska.

1884. Walker, James B., 1617 Green Street, Philadelphia.
1885. Ward, Samuel B., 135 North Pearl Street, Albany, N. Y.
1891. Watson, E. W., 131 North 20th Street, Philadelphia.
1885. Weber, Leonard, 25 West 46th Street, New York.
1897. Whitcomb, H. H., Norristown, Pa.
1885. Williams, H. F., 450 Classon Avenue, Brooklyn.
1884. Wilson, James C., 1437 Walnut Street, Philadelphia.

Total, 121 Members.

MINUTES OF BUSINESS MEETING.

The Fourteenth Annual Meeting of the Association was held in Washington, D. C., in connection with the Fourth Congress of American Physicians and Surgeons, at which the following members were present:

Dr. A. C. Abbott, Phila.
" G. E. Abbot, Washington.
" R. H. Babcock, Chicago.
" V. Y. Bowditch, Boston.
" C. N. Brandt, Hot Spgs, Va.
" D. H. Bergey, Phila.
" J. W. Brannan, New York.
" N. Bridge, Chicago.
" F. W. Chapin, Asheville.
" A. Coolidge, Jr., Boston.
" R. G. Curtin, Phila.
" J. Daland, Phila.
" W. H. Daly, Pittsburg.
" H. L. Elsner, Syracuse.
" S. A. Fisk, Denver.
" W. E. Ford, Utica.
" C. F. Gardiner, Col. Springs.
" W. M. Gibson, Utica.
" L. C. Gray, New York.
" H. A. Hare, Phila.
" I. H. Hance, Lakewood.
" Guy Hinsdale, Phila.
Dr. E. F. Ingals, Chicago.
" A. Jacobi, New York.
" W. W. Johnston, Wash.
" L. D. Judd, Phila.
" F. I. Knight, Boston.
" S. W. Langmaid, Boston.
" J. H. Musser, Phila.
" R. C. Newton, Montclair.
" A. C. Peale, Washington.
" F. Peterson, New York.
" W. F. R. Phillips, Wash.
" C. E. Quimby, New York.
" C. C. Ransom, New York.
" S. D. Risley, Phila.
" Beverley Robinson, N. Y.
" W. D. Robinson, Phila.
" K. von Ruck, Asheville.
" A. A. Smith, New York.
" S. E. Solly, Col. Springs.
" J. Madison Taylor, Phila.
" J. B. Walker, Phila.
" J. C. Wilson, Phila.

Guests.

Dr. C. H. Alden, U.S.A., Wash.
" Charles D. Alton, Hartford.
" C. P. Ambler, Asheville.
" S. W. Battle, Asheville.
" S. G. Bonney, Denver.
Dr. C. M. Drake, Atlanta.
" S. A. Knopf, New York.
" J. J. H. Love, Montclair.
" E. A. de Schweinitz, Wash.
" J. E. Stubbert, Liberty, N. Y.
Dr. J. K. Weaver, Norristown, Pa.

The papers read on the first day were the following:

President's Address, by Dr. E. Fletcher Ingals. (Discussed.)

"Choice of a Summer Residence," by Dr. F. I. Knight. (Discussed.)

"Mountain Fever," by Dr. Thomas Darlington, Jr.; author absent, paper read by title.

"Renal Disease as Affected by Climate," by Dr. I. N. Danforth; author absent, paper read by title.

"Climate or Environment as a Factor in the Repair of Neurasthenia and Melancholia," by Dr. J. Madison Taylor; read by author.

"Nervous Diseases as Affected by Climate," by Dr. Sanger Brown; author absent, paper read by title.

"The Comparative Merits of Resorts in Colorado, New Mexico, and Arizona," by Dr. S. E. Solly; read by author.

Dr. Newton read a paper on "Some Personal Observations upon the Effects of Changes of Climate upon the Health of Men and Animals."

A discussion of the papers of Drs. Taylor, Solly, and Newton followed, the others having been read by title owing to the absence of their authors.

The Secretary and Treasurer reports that the membership of the Association has undergone the following changes: By death, one—Dr. Jacob Reed, of Colorado Springs; by resignation, two—Prof. Mark W. Harrington, of Seattle, and Dr. J. P. Crozer Griffith, of Philadelphia. One has been dropped for non-payment of dues; two have failed to qualify for membership.

The last volume of the TRANSACTIONS was distributed to the members, and to forty journals and scientific institutions at home and to thirty-five abroad; the latter being sent without expense to the Association by the courtesy of the International Bureau of Exchanges at the Smithsonian Institute. The cost of the volume was $538.00, which is more than the annual income.

There is at present $139.50 in the treasury, and about $175 due the Association. All bills have been paid in full up to date.

Over three hundred letters have been received by the Secretary during the year, relating to the business of the Association, and they have been duly acknowledged and filed.

The Secretary then stated that the Society has received an invitation from the British Medical Association to send delegates

to attend its meeting at Montreal, August 31st, of this year, and the two following days; also, a letter from the Bernalillo County Medical Society of New Mexico, together with a set of resolutions adopted by that society.

The Association elected as its representative to the British Medical Association, Dr. E. Fletcher Ingals, of Chicago.

Second Day—*Business Meeting.*

The first business was the reading of the report of the Nominating Committee. It was then moved and seconded that the report be accepted as read. The motion was carried.

It was then moved and seconded that the Secretary be instructed to have the ballots cast for the officers nominated by the committee. This motion was carried unanimously. This was done, and it was found that all the officers voted for were unanimously elected. Dr. E. O. Otis, of Boston, was elected as President; Dr. Beverley Robinson, of New York, and Dr. C. F. McGahan, of Aiken, S. C., Vice-Presidents, and Dr. Guy Hinsdale, of Philadelphia, Secretary and Treasurer.

The next business in order was the reading of the report of the Committee on Health Resorts. The chairman of that committee, Dr. Bowditch, explained that although they had the bulk of the work done, yet it was not quite all accomplished, and they hoped to be ready to make a fuller report next year. The report was then allowed to go over until the next annual meeting. The report on Mineral Springs was made by Dr. Peale. It was then moved and seconded that the report be accepted and the committee continued. The motion was carried.

The following candidates for membership were elected:

Honorary Members.

Dr. Hermann Weber, London.
" Charles Theodore Williams, London.

Active Members.

Dr. C. H. Alden, Assistant Surgeon-General, U. S. A., Washington, D. C.
" Frank Billings, Chicago.
" N. S. Davis, Jr., Chicago.

Dr. Carroll E. Edson, Denver.
" Gustav Fütterer, Chicago.
" Calvin DeWitt, Surgeon, U. S. A., Fortress Monroe.
" Alexander D. Blackader, Montreal.
" Frank S. Johnson, Chicago.
" James Nevins Hyde, Chicago.
" I. N. Danforth, Chicago.
" Sanger Brown, Chicago.
" E. C. Register, Charlotte, N. C.
" S. G. Bonney, Denver.
" W. D. Bratton, Albuquerque, N. M.
" Charles D. Alton, Hartford.

The Council recommended that the Constitution be changed, so that Article III., Section 1, shall read: "This Association shall consist of *active*, *corresponding*, and *honorary* members; the latter shall not exceed twenty-five (25)."

Article III., Section 3. "The power of nominating honorary and corresponding members shall be vested in the Council."

The following resolution was offered by Dr. R. C. Newton:

Resolved, That this Association views with great disfavor the custom which seems to obtain in some health resorts, of sending to their homes patients suspected of having been infected with typhoid fever, and thereby greatly endangering the lives of these patients.

Resolved, That a committee be appointed to take this matter under advisement and report at the next meeting of this Association.

Carried.

The Council recommended that the subject of the investigation of the climate as set forth in a circular letter received from the Bernalillo County Medical Society of New Mexico, be approved. The matter was referred to the following committee: Dr. W. F. R. Phillips, Dr. Guy Hinsdale, and Dr. W. D. Bratton.

The following resolutions were adopted by the Society, having been prepared by the committee undersigned:

Resolved, That the Association learns with much regret that the Weather Bureau has been obliged to discontinue the publication of, and the work exemplified in its recent publication, *Climate and Health*.

Resolved, That this Association would urge upon the Secretary of Agriculture and the Chief of the Weather Bureau the desirability of resuming the said publication, and that the members of the Association urge upon the members of Congress from their States to furnish an appropriation for the purpose.

JAMES B. WALKER,
S. E. SOLLY,
W. W. JOHNSTON.

The Secretary then read a letter of invitation extended to the members of the Association to visit Asheville, N. C., and to hold their next annual meeting at that place; but as the Council had recommended that the next meeting should take place at Bethlehem, in the White Mountains of New Hampshire, it was decided not to accept the invitation for that year.

It was moved and seconded that the recommendation of the Council regarding the next meeting place be confirmed, and the motion was carried.

It was moved and seconded that the thanks of the Association be extended to the Buncombe County Medical Society of North Carolina, as well as to Dr. von Ruck. The motion was carried.

Adjourned.

GUY HINSDALE,
Secretary.

PRESIDENTIAL ADDRESS.

THE ANTISEPTIC TREATMENT AND THE LIMITATION OF CLIMATIC TREATMENT OF PULMONARY TUBERCULOSIS.

By E. FLETCHER INGALS, M.D.,
CHICAGO.

Gentlemen of the American Climatological Association: In assuming the duties of your presiding officer I again thank you for the high honor which you have conferred upon me and wish to congratulate you upon the status of this Association. From the origin of this Association to the present time it has steadily increased in numbers and grown in influence until at present its members are scattered throughout the length and breadth of this land and exert an untold influence for the advancement of science, the alleviation of suffering, and the prolongation of human life. In 1884 this Association numbered forty-two members. Since that time we have had enrolled, all-told, one hundred and ninety-one names. Of these, ten have been dropped, thirty-five have resigned and thirty-two have finished their work. During the year just passed we have been called upon to mourn the loss of one of our fellows, Dr. Jacob Reed, of Colorado Springs. Dr. Reed had lived in Colorado Springs over twenty years and was much respected and loved by his acquaintances. He was a man of strong individuality and an active, earnest physician who will be greatly missed. To-day we number one hundred and fourteen active members, and the Council will present several new names for your consideration.

When this Association was first organized the climatological possibilities of the United States were almost unknown; since then the industry and enthusiasm of our members, aided much by the accurate data obtained by the United States Weather Bureau, have demonstrated the fact that within our borders may be found every variety of climate possessed of value in the healing or prevention of disease. Twenty-five years ago there were a few, more or less noted health-resorts in the country, where invalids repaired of their own volition, or were occasionally sent by the few physicians familiar with the locality; but numerous places where invalids may now obtain satisfactory accommodations in the best atmospheric conditions were unknown. That the members of our Association have done much in searching out the more valuable resorts and in securing suitable accommodations for patients cannot be gainsaid, and that we have correspondingly added our share to the great work of prolonging human life and mitigating suffering, no one can doubt, but that very much is yet to be learned, that the deductions from our observations are still in many instances crude, and that we have often been too enthusiastic in our hopes for individual localities, cannot be denied; yet, as a rule, our members have been reasonably conservative in their estimates of the value of climate and have patiently and conscientiously studied and labored for the advancement of science and the benefit of their patients.

Over-estimation of the value of climate, as well as of drugs, often occurs through inexperience or over-enthusiasm of the physician, and usually the most laudatory articles are from the pens of those having comparatively little information. We all grow more conservative as the years go by, and most of us learn that the deductions from some, even of our own, earlier observations are erroneous. Therefore, it not infrequently happens that the careful physician finds himself unable to accept the conclusions even of one who may have been painstaking and conscientious in his work. The physician must needs wait two or three years for any climate or any medicine to be tested before he can form a fair estimate of its value.

It must be remembered that the varying conditions affecting limited observations may necessarily militate much against the conclusions drawn from them, and, therefore, one who is slow to accept new hypotheses should not at once be put down among ancient geological specimens.

The purpose of this paper is not to build up new theories, nor yet, as an iconoclast, to tear down where we are unable to replace, but to draw the attention of this Association and of those who may read our proceedings to a few important facts which seem established by experience.

In the title of this paper I have referred to the antiseptic treatment of pulmonary tuberculosis which, in the light of our present knowledge of the origin of the disease, seems to me to have a specific tendency to check its progress, though I would in no way minimize the importance of tonic and supporting treatment and of good hygienic surroundings.

Since the Koch bacillus was recognized as the ultimate cause that, under favorable conditions, produces tuberculosis, there have been unceasing experimentation and careful clinical observation to find some agent or agents that would destroy the microbes without injury to the tissues upon which they rest or within which they may be imbedded. Contemplating this long line of experiments and scrutinizing the vast array of statistics we are forced to admit that it has not been demonstrated that any remedy, or any class of remedies, has the power to destroy this bacillus, when ensconced in the human body, with any degree of certainty; yet, when we carefully analyze the various methods of treatment that have been more or less successful in checking the progress of the disease, we nearly always find that they have been of a distinctly antiseptic character.

We must remember that, although the bacillus is the ultimate cause of tuberculosis, it is innocuous excepting under favorable conditions, and, therefore, those supporting measures that enable the tissues to pen up or to bar out this pestilential microbe must receive a large part of the credit for the successful management of any case. The late Austin Flint, in his work on *Phthisis*, stated that very many of the phthisical pa-

tients that had recovered were those who had refused or neglected all treatment. This must not be taken as advice to those suffering from tuberculosis to rely upon mental influences and reject the assistance of science, for it is reasonable to suppose that the majority of those who have recovered without any assistance have done so from the sheer resisting force of their vital processes, and that many of those who did not recover relied too long upon the *vis medicatrix naturæ*, only to find that it failed at the end, while judicious treatment might have saved their lives.

The fact referred to by Austin Flint reminds us that we must be extremely cautious in attributing to any particular remedy the benefit that may occur in any individual patient, or in any series of patients, with consumption; yet typical cases that have been cured, and have remained well under conditions where the majority of patients would have steadily grown worse and died, may justify us in believing that the remedies used were of some value, and that a more perfect application of the same may ultimately lead to even better results. I know, and I wish that the general profession could realize as it should, that no case of consumption can be classed among the cured in eighteen or twenty months, and that even many who live for years can never properly be called cured. Nevertheless I hope to show by a few briefly reported cases that betterment sufficient to commonly be termed a cure may often be obtained from antiseptic treatment. From my own experience I fully believe that, aside from tonic and nutritive agents, antiseptics are the only medicines that have any power in checking the progress of tuberculosis, and I as firmly believe that when they are thoroughly used so as to bring the system as nearly as possible to a point of saturation they are of great value in a large percentage of cases, if used in the early stage of the disease.

The first case to which I wish to call attention was treated by the Shurly method and reported, with a series of others, to this Association several years ago, but it has acquired additional interest from the time that has elapsed since that treat-

ment and from the good health the patient now enjoys, though he remains in the same surroundings as when the disease was contracted. In this instance the patient greatly improved under the use of iodine and later oil of cloves, with the occasional use of the extract of hyoscyamus, nux vomica and quinine, for cough, appetite, and digestion. The chief benefit appeared to come from the antiseptics.

Case I.—V. W. J., aged twenty-nine years, clerk, came to me in February, 1891, complaining of cough and expectoration of three or four weeks' duration, and stating that he had not been well for four or five months. He was able to attend to business, had not lost much flesh, but the pulse was 96 and the temperature 99°. He was raising at the time about two ounces of muco-pus daily, and had had two moderate hemorrhages in the past few months. There was no hereditary predisposition to phthisis. Physical examination showed diminished motion with high-pitched respiratory sounds over the left apex as low as the second rib, and indistinct subcrepitant râles. The microscope revealed many tubercle bacilli in the sputum. I instituted the Shurly treatment, injecting from seven to fifteen drops of the solution of iodine every two or three days ; I gave also a bitter tonic. The injections were continued in this way for about four weeks, and subsequently once a week for six or eight weeks longer. At the end of eight weeks it was noted that he was doing well, the weight was normal and there was very little expectoration. Subsequently the patient was seen at intervals varying from one or two weeks to three or four months, or a year or more, at times when he had taken cold or had some special cause of debility, but he was not kept upon any continuous treatment. Two years after he first began treatment, on account of a renewed cold with increased cough, he was given strychnine, with other bitter tonics, and the oil of cloves as an antiseptic. He took the oil of cloves in twenty-five drop doses for about three months, beginning it at a time when he went South for a vacation of five or six weeks, and continuing it for six weeks after his return, by which time he had gained fifteen pounds and felt so well that he discontinued

all treatment. On two other occasions, when he became run down and the disease seemed to be lighting up afresh, he took the oil of cloves with the result, as he believes, of speedily checking the trouble.

Other remedies consisted of tonics, digestive agents, and occasionally hyoscyamus as needed. He was out of the city on two or three occasions, but only for a short time. In January, 1897, when he returned to me on account of a slight cold, he was looking very well, and had had no symptoms of tuberculosis for a long time.

The following case was also reported at the meeting just referred to, and as the patient is still in very good health a brief *résumé* of the history is of interest, as it apparently shows good results from the antiseptic use of iodin, although the improvement has been mainly due to climate:

Case II.—Mrs. W. B. N. I first saw this patient in April, 1888, when it was found that consolidation of the left apex extended as low as the third rib. Subcrepitant râles extending considerably lower, with a few subcrepitant râles over the upper part of the right apex. She was given tonics and supporting treatment, together with inhalations of iodine, under which she steadily improved until the latter part of gestation in the spring of the following year. Shortly afterward she began to decline and steadily failed until in August of the same year, when the signs of phthisis had much increased and there was a large vomica in the left lung. She was extremely weak and anæmic, and her life was despaired of. She was so ill that it seemed impossible to obtain benefit by change of climate, but her friends insisted upon it and took her to California to an elevation of twenty-five hundred feet. During most of her illness she had suffered much from disturbance of the digestive organs, and after arriving in California had what appeared to be an attack of tubercular meningitis; however, she gradually recovered and subsequently went for a few months to an altitude of thirty-five hundred feet, in Texas, and later on to Las Vegas, where she remained for a couple of months. At the time she went to Las Vegas I was using iodine according

to Shurly's method, and at my suggestion her physicians there placed her upon it. During about two months that she remained under the treatment she gained very rapidly and the expectoration greatly diminished. She then went to Colorado Springs, where she is still living in comfortable health, though fibrosis has extended well through the left lung. When I first examined the sputum in 1895, it contained many tubercle bacilli.

In this case climate undoubtedly should be given the credit for nearly all of the improvement; but although life was saved under the most unpromising circumstances by the antiseptic air of a good climate, yet two periods of especially marked improvement were coincident with the use of iodin, and the improvement was so great that I feel justified in believing that it was aided much by the antiseptic.

In the following case no other treatment was employed than the oil of cloves, which appeared to cause great improvement; but I saw the patient only twice, and am unable to ascertain the subsequent history:

Case III.—Mrs. X., aged about thirty-five years, came to me about two years ago with well-marked symptoms and signs of the early stage of phthisis. I ordered for her the oil of cloves in doses ranging from five to twenty-five drops five times daily, and I did not see her again for three or four months. She then returned having lost all of the symptoms of tuberculosis and many of the physical signs. She said she felt perfectly well. The improvement in this instance seemed entirely due to the antiseptic treatment, and the result might safely be called a cure if she still maintains the condition in which I last saw her.

The following case had the benefit of both internal antiseptics and of an antiseptic atmosphere:

Case IV.—Dr. G. C. A., aged twenty-six years, had been in good health previous to consulting me on August 18, 1894. He had lost one brother and two uncles from tuberculosis. Two months before seeing me he had a hemorrhage from the lungs, and his temperature ran up to 103°. At the time he con-

sulted me his appetite and digestion were good, but he had lost twenty pounds of flesh, and was having a daily temperature of 100.5° to 103° F. He was coughing considerably and expectorating about one and a half ounces of muco-pus daily. I found slight dulness at the left apex, low as second rib, with feeble respiration and subcrepitant râles extending down to the fourth rib. Microscopic examination showed many tubercle bacilli in the sputum. Antiseptics were ordered, but when I saw him a few weeks later he looked so much worse that I was not at all surprised in a few months to hear the report of his death. However, the report proved untrue, for in November of the same year he had gone to Montana to an altitude of about four thousand feet, where he rapidly improved, gaining fifteen pounds within two months; but when the weather became bad he caught cold and began to fail. Shortly after he went to New Mexico, where he again improved. During all this time he had been using guaiacol applied to the surface, and creosote internally. Soon after he arrived in Las Vegas, in January, 1896, his cough disappeared, and with it the pains which he had formerly suffered in the chest. He soon found that his respiratory capacity was increasing, and ere long the difference in the circumference of the chest between inspiration and expiration amounted to five inches, and he had gained thirty-one pounds since going to a high altitude. He continued the guaiacol and creosote and also took cod-liver oil, alternating at times with syrup of the hypophosphites. This patient is now living in Denver in good health.

In this case the almost continuous use of antiseptics was combined with the benefits of a high altitude and dry atmosphere, but the patient attributes much of the benefit to the antiseptics, and I have no doubt he is correct.

In the following case the improvement was apparently due to tonics and alcoholic stimulants:

Case V.—Mrs. D. K. M., aged twenty-five years, came to me on November 15, 1895, complaining of pain in the left lung of three months' duration, cough, afternoon fever, dyspnœa, and loss of strength. She had lost ten pounds in weight

in three months. She expectorated a small quantity of thick whitish sputum, and about a month previously had raised nearly half an ounce of blood. The pulse when I first saw her was 88, temperature normal. There was dulness at the left apex as low as the first rib. Subcrepitant râles numerous at the apex in ordinary respiration and heard all over the left lung on deep breathing. Respiratory sounds were diminished in intensity over the upper half of the lung. Many tubercle bacilli were found in the sputum. She was given moderate doses of nux vomica, hyoscyamus, quinine and carbonate of guaiacol in capsules. She continued these remedies for a year, but it does not appear to me that the doses of guaiacol were large enough to in any way account for her improvement. During this time she took a small glass of whiskey before each meal and at bedtime, and probably from this cause gained fifteen pounds. A year later, February, 1897, she had gained a few pounds more, was much stronger, being able to walk several blocks a day, coughed very little indeed, and that only to clear the throat. Her pulse was reported to be from 84 to 88, but the temperature record I could not obtain. She had a splendid appetite and appeared practically well. This patient went to Manitou, Colorado, for ten weeks shortly after she began the treatment, and subsequently spent a few weeks in Kansas City, but she was steadily improving before she made these trips. She still takes the whiskey occasionally.

The following case was uniformly benefited by antiseptic medicines, although he also had the advantage of a good climate part of the time:

Case VI.—Mr. A. G. A., aged thirty-nine years, came to me first in September, 1891, complaining of hacking and clearing of the throat for the last three years and hoarseness for the last three weeks, and some pain on swallowing. He had lost weight and strength, and had experienced five or six hemorrhages from the lungs four months previously, amounting to eight or twelve ounces each, as nearly as he could ascertain. He had a poor appetite, and had lost about ten pounds in weight and had suffered from dyspnœa upon exertion. His

pulse was 72 and temperature normal when I first saw him. The epiglottis and arytenoids were swollen 30 per cent., and the vocal cords considerably congested. There were no distinct sounds over the lungs upon percussion, but there was broncho-vesicular breathing with a few subcrepitant râles extending as low as the second rib in front and to the seventh rib behind. Microscopic examination showed a large number of tubercle bacilli in the sputum. I ordered for him the chloride of calcium and maltine with hypophosphites, with small doses of cannabis indica and hyoscyamus, to relieve cough, and nux vomica and quinine to improve the appetite. He went to Colorado, where he remained for five months. During this time and until a month later he continued to take the medicines first ordered. He then called at my office and reported that he had not gained much in weight, but had a good appetite and was very well. At this time I ordered for him the oil of cloves in doses of from five to fifteen minims to be taken five times daily. He returned to his home in Northern Wisconsin, where he remained until the following December. He then went again to Colorado for four months, and from there returned to his home, where he has remained ever since. I first gave him the oil of cloves May 21, 1892, and he took it for sixteen months, half of the time in doses of forty-five drops a day and the remainder of the time in doses of seventy-five drops daily. During this time he had gained about twenty pounds in weight, which he retained until the latter part of August, 1896, when he had another hemorrhage followed by severe gastric disturbance which continued for many weeks. During this attack he lost twenty pounds. In January, 1896, I ordered for him the carbonate of creosote, which he took for about sixty days, and then went back to the oil of cloves, which he continued to March 1, 1897, since which time he has taken nothing. He has since then had an attack that he calls grippe and has lost ten pounds more. His appetite is not very good, but his pulse is only 84, temperature normal, and he says he feels in fair general health and strength, and has at present very little cough and expectoration. He tells me that he has

always improved when taking the oil of cloves, and he attributes most of the benefit that he has received to that remedy.

In the following case the improvement may be attributed to alcoholic stimulants alone:

Case VII.—Mr. D. W., aged forty-seven years, came to me November, 1894, complaining of having taken cold and having expectorated about five or six ounces of blood in the last few days. He had been feeling poorly for about two weeks. There was an hereditary history of consumption on both sides of the family, and he had lost two brothers and two sisters with the disease. His weight was normal, pulse 132, temperature 99.6°. Physical examination showed consolidation of the left apex with not very well defined broncho-vesicular breathing and a number of subcrepitant râles. Many tubercle bacilli were found in the sputum. The oil of cloves was ordered for the patient, together with nux vomica, quinine and carbonate of guaiacol, but he appears to have discontinued all treatment after a week or two excepting three to five good drinks of whiskey daily. Two years later when I saw him he had gained twenty pounds, the pulse was 102, the temperature normal, and there were very slight physical signs of disease. He told me that he felt as well as he ever had in his life.

In this instance I am inclined to attribute the improvement to the nutritive and antiseptic properties of the alcohol contained in the whiskey.

In health the bactericidal properties of the blood are able to destroy the bacilli with which we are constantly being infected; but in the depressed state accompaning actual pulmonary tuberculosis these elements are more or less deficient. If in this condition some antiseptic be introduced in small or larger quantity, according to the condition of the blood, we should be able to make up for this deficiency. If there is any ground for this belief alcohol is exhaled so freely that it does not seem unreasonable to attribute to it antiseptic influence in phthisis. The patient did not go out of the city, and, indeed, made no change whatever in his residence or business excepting that he was obliged to take more rest because of great weakness.

The following history illustrates the fortunate outcome of a case of tuberculosis without the aid of either antiseptic remedies or antiseptic atmosphere, although it appeared most unpromising in the beginning. It is introduced with the hope of rendering the reader more conservative in estimating the value of remedies and climates:

Case VIII.—Mrs. L. B. J., aged thirty-one years, came to me in February, 1891, complaining of trouble with the lungs of three years' duration, though she had been worse during the preceding six weeks. There had been consumption on her father's side of the family, and she had suffered from inflammatory rheumatism five different winters several years ago. She had a very troublesome cough, especially in the morning, and expectorated about five drachms of muco-pus during the day, containing some blood at times. She weighed one hundred and forty-seven pounds, having lost about five pounds. The pulse was 88 and regular, the temperature 100°. She had a good appetite but poor digestion. Physical examination revealed dulness over the upper part of the left lung with subcrepitant râles as low as the seventh interspace, and the microscope showed many tubercle bacilli in the sputum. She was ordered moderate doses of cannabis indica and hyoscyamus to relieve cough, nux vomica for her appetite, creosote in small doses, and papain for the digestion. She was given also a few injections of the chloride of gold and sodium and of iodin, according to Shurly's method, but she objected to it on account of the pain. She continued internal remedies similar to those first ordered, much of the time for about three months, and subsequently I only saw her at irregular intervals of several months or a year or more. Four years after she first visited me there were still a great many tubercle bacilli in the scanty sputum, but she had gained flesh and to external appearance was in perfect health. Subcrepitant râles, which at times had been very numerous over the chest, had disappeared. I have not seen her for a couple of years, but my associate saw her upon the street in March of this year and reported that she appeared in excellent condition. After the first three months

of treatment she did not take any remedies regularly, and she has not been out of Chicago for any length of time.

It is unnecessary to cite cases that have been relieved or cured by climatic treatment, because every one who has had much experience in the treatment of pulmonary tuberculosis must have observed many patients that were undoubtedly benefited by change of climate, yet in a large percentage of such cases it is impossible to estimate accurately the real cause of improvement. I have no doubt that in many instances the change of food, of scene and of other surroundings which might stimulate the process of nutrition, has as much to do with the favorable progress of a case as continued residence in an aseptic atmosphere. This was illustrated in the case of a gentleman who was for several years under my care in the latter part of the eighties, suffering from pulmonary tuberculosis, but who without any change of climate maintained a good degree of health that allowed him to attend to business with only now and then a few days' confinement to the house; but at the end of three or four years he began to have hectic fever, to emaciate rapidly, and to cough excessively. There were present also numerous pulmonary signs indicating rapid progress of the disease in the lungs. At the time his financial condition was such that he felt unable to go to a different climate, but he obtained the opportunity of making a short trip of only about three weeks to Dakota, from which he returned very much improved. The improvement steadily continued, and in the course of a few weeks more he was as well as he had been for a long time. Subsequently he continued at his business for about four years, then again began to decline, and went to the Southwest into a dry atmosphere and high altitude, where he again improved for some time, but at the end of a few months he died suddenly from hemorrhage. In this instance certainly very little could be attributed to the aseptic atmosphere, and we have every reason to believe that the improvement was like that of very many other persons whom we every year see gain greatly in mental and physical vigor from short vacations.

If we concede that certain cases may be benefited by a simple change to agreeable scenes and surroundings, we must also admit that certain other cases when placed in the best climate away from home and friends and under various depressing conditions speedily grow worse and rapidly decline and die; whereas they might have lived for months, or possibly years, if they had remained at home. Another difficulty in estimating the value of climatic influences arises from the fact that some patients, when they go away from home, continue the same treatment which had been used previously, and, therefore, it would be unjust to ascribe all improvement to the climatic conditions. Many physicians in favored climates are accustomed to tell patients as soon as they arrive in the aseptic atmosphere to discontinue all previous treatment; but, at the same time, some physicians endeavor to impress upon the patient's mind the necessity of yielding themselves to the climatic influences with the aid of such remedies only as the exigencies of the case may demand. I believe that in many cases such advice is most untimely, for if we admit that remedies do any good at all in unfavorable climates, we must also admit that the same remedies should aid in the restoration to health much more when the patient was placed amid favorable surroundings. I have known not a few who were doing comparatively well at home to go to a favorable climate with the result of becoming immediately worse and rapidly declining to death. Some of these I fully believe might have lived much longer if they had not made the trip, and some of them I think might have continued to improve even more rapidly with the trip if they had continued former remedies.

As I have elsewhere stated, I believe that, all told, about 33 per cent. of patients affected with pulmonary tuberculosis recover under ordinary conditions, and I think that patients sent early to a high altitude and dry atmosphere have their chances increased fully 50 per cent. This belief is based upon the well-known fact that the records of autopsies show that in 25 per cent. of bodies dying from other diseases than pulmonary tuberculosis the previous existence of this disease is demon-

strated in the apices of the lungs, also upon the oft-repeated statement that a large percentage of those sent early to a good climate recover; and further upon my personal observation of many cases. After consolidation of the apex of the lung has extended below the third rib, by which time the second stage is generally fully established, I feel that I have ample reason for believing that from 15 to 30 per cent. may be greatly benefited by climate, although life is seldom prolonged more than five or six years. Even after breaking down of the lung-tissue has begun, a few may have their lives considerably prolonged by suitable climate. I have no doubt, however, that in the latter part of the disease the fatal result is generally hastened by the fatigue and the mental and physical distress incident to the journey. The physician should carefully study not only the physical but the social and financial conditions of his patient before recommending a change, and while it is not necessary to say it to the members of this Association, I wish to impress upon others that it is neither scientific nor kind to send patients with consumption indiscriminately to places from which we have simply heard favorable reports. As a rule, in the first stage a warm climate is most salutary, but it is not so important providing an abundance of sunshine and a dry atmosphere are obtained, though many phthisical patients are better in a southern latitude in winter. It will be found that patients who feel best in winter are likely to be benefited by a comparatively cool climate, the others in a warmer temperature. In the first stages it is desirable, when there are no contraindications, that patients go to an altitude of from six to seven thousand feet, but this is not suitable for persons who are nervous to a marked degree, or who have a high temperature, or who have pronounced cardiac disease, emphysema, or laryngeal complications. Laryngeal tuberculosis is generally markedly aggravated by high altitudes. Hæmoptysis is not, as is often supposed, a contraindication to a sojourn in a high altitude. On the contrary, bleeding is often promptly checked by this change, and those who seldom or never have hemorrhages in a high altitude frequently experience them quickly upon return

to a lower level. In the second stage of the disease a high altitude is often beneficial, but we cannot feel so certain of its result, therefore it is best to send the patients to an altitude of not more than two or three thousand feet, and if they do well subsequently advise the higher level. A warm, moist atmosphere seldom appears to have any useful effect in prolonging the life of a consumptive patient, though it undoubtedly adds to their comfort, in certain instances relieving the irritability of the bronchial mucous membrane. The majority of patients who are unable to take care of themselves seldom receive much benefit from a change of climate, but as a few of them do, the experiment is constantly made, more often, I think, by the friends than by the physician. Wherever practicable, even in the best cases, it would be desirable for friends to accompany the invalid, because we must not forget the necessity of maintaining the nutrition, not only by suitable food, but by cheerful environment foreign to those who, sick and lonesome, find themselves the prey of nostalgia. Before recommending a patient to change climate we should inquire as carefully as practicable as to his disposition and social and financial condition. If he is unable to obtain the comforts and some of the luxuries of life away from home, it is generally unkind to recommend any change of climate, because the chances are greatly that it would do more harm than good. If he is despondent he should have a cheerful companion. If he is in constant terror from the bacilli floating in the atmosphere, or is depressed by the sight of sickness in others, he should be removed as far as possible from other invalids suffering from tuberculosis. Indeed, this would be a good rule in many cases, but it is hardly ever practicable, because as soon as a locality obtains a reputation in the cure of tuberculosis, many invalids are attracted thither. The physician must remember that he has a duty to others as well as to the patient, and that he must sometimes consider the healthy friends, or more particularly the widow and helpless children soon to be thrown upon the world. Hardhearted as it may appear, the physician must then answer to his conscience whether it is right to advise the friends to make great sacri-

fices with the hope of prolonging the invalid's life for a few weeks or months. As a general rule, our duty is to the patient only, but this, like other general rules, is subject to many exceptions. Unhappily it is only in the minority of cases that experts in the Eastern and Middle States are consulted as to the wisdom of a change of climate by the patients who come under their observation. The greater number come with their minds already made up to go somewhere, so that we can only guide them to the least objectionable place. This explains the fact often observed at health-resorts, that the majority of patients sent away might better have been kept at home.

In conclusion, in addition to tonic, supporting, and anodyne remedies various antiseptics appear to possess great value in the treatment of pulmonary tuberculosis, but in order to get good effect it is imperative that the system be as nearly saturated with them as possible. They should be given at first in small doses, but the amount should be steadily increased until the maximum dose is obtained, care being always taken not to disturb the digestive organs. For example, with the oil of cloves we may begin with five drops, to be given in capsule from three to five times daily after each meal and in the middle of the forenoon and of the afternoon, the medicine always to be followed by a glass of milk. The second day the dose should be six drops, the third seven drops, and so on, until a dose of twenty-five or thirty drops is given each time.

Creosote can seldom be given in sufficient quantities to have any material effect, because of the disturbance of the digestive organs which it is liable to cause and because of its coagulating effect upon all albuminoids. The same may be said of carbolic acid.

Carbonate of creosote is much more bland, and may be given in doses of from five to sixty drops after each meal with great benefit.

Guaiacol may be given in much the same way as the oil of cloves, though in somewhat smaller doses, but it is usually less easily borne than the carbonate of creosote or oil of cloves, and often cannot be tolerated in sufficient quantity. The car-

bonate of guaiacol may be used in much the same way as guaiacol itself, but most patients seem unable to take it in sufficient doses.

Oil of cloves and carbonate of creosote are the most satisfactory antiseptics for internal use. Iodin may be used as recommended by Shurly with undoubted benefit, but it causes considerable pain and is open to the objection that it necessitates too constant attendance of the physician; it may also be used advantageously as an inhalant.

Patients should not be sent from home unless their financial and social condition is such as to render the journey and sojourn easy and agreeable.

In the first stage of the disease patients should, as a rule, go to a high altitude where the atmosphere is dry and as warm as practicable. In the second stage they should be sent to a medium altitude; and in the advanced stage, if sent anywhere, it should be to a low altitude.

Patients who have been improving on any course of medication should not discontinue it upon going to a different climate, but, however valuable any remedy may appear, it should not be continued if it becomes clear that it is deranging the digestion.

When sojourning in a favorable climate the patient should be out of doors as much as practicable during the pleasant portion of the day, should avoid excessive heat, excessive cold, and unusual fatigue.

Of anodynes to check cough, hyoscyamus, camphor, cannabis indica, stramonium, and conium are of most value, because they can generally be taken in sufficient quantities without disturbing the digestion, whereas opiates are usually deleterious in whatever form they may be employed.

The majority of patients sent from home in the latter stages of pulmonary tuberculosis are injured by the journey, and their lives correspondingly shortened, though in a small percentage very great benefit is obtained in a warm and very dry climate

DISCUSSION.

Dr. Knight: Inasmuch as part of this paper is of especial interest to us, I think that it ought to be open to discussion. I will be glad to hear from any members present upon the subject.

Dr. Solly: I have listened with great interest to Dr. Ingals's admirable address; he has put the whole subject very clearly before us, especially that which relates to the patient's pocketbook. It is of no use for physicians to suggest so expensive a change of air that the patient will be worried by his want of means, so that he cannot enjoy the change in peace. Further, it must not be forgotten that the physician should not make final choice of a resort until he has obtained the facts about the soil and slope of the ground, as well as the other important details; for, while the climate may be all right, the local conditions may be all wrong.

As to the value of antiseptics in the treatment of phthisis, which the President so strongly indorses, while the evidence is not all in, so that we can prove the matter one way or the other, yet reasonable deduction seems to lead to the belief that they are not of any specific value, and this opinion my clinical experience confirms. In a recent exhaustive search through the literature of the subject of the modern treatment of tuberculosis I was struck by the multiplicity and variety of specifics, especially antiseptics, whose positive value is vaunted in good faith by numerous reputable physicians, and I came to the conclusion that the favorable, though usually temporary, results reached by so many different routes were caused by the stimulative and alterative effects upon the patient's mind of the hope and interest inspired by a novel and exact method of treatment; and also because the doctor, anxious for success in his experiment, watched and controlled his patient's daily life with greater care than usual, and the patient himself was more obedient and cautious. In my practice I have taken notice of patients who were under specific treatment, and at the same time watched patients whose condition and circumstances were similar, but who were not using specific remedies, and failed to find any better results among the former than among the latter class. I think that where antiseptics are called for, as to counteract certain symptoms, that the oils, such as those of peppermint, cinnamon, or cloves are better than creosote. While the future may have great surprises for us in the therapeusis of tuberculosis, and experimenting should continue, I believe that at present our only safety lies in improving the quality of the blood by food and climate, and thus increasing nutrition and vital resistance; and, further, in regulating exercise, both bodily and mental, so as to stimulate or soothe the nervous

system, as the patient's condition may demand, and in such general and symptomatic treatment by drugs as seem indicated in the particular case.

Dr. Ingals: It has been moved and seconded that the visitors of the Association be invited to participate in the discussions, and that the discussion of each individual be limited to five minutes. Motion carried.

Dr. Curtin: I was one of the delegates of this Society to the Pan-American Medical Congress in Mexico, and while there I was very much interested in the study of the climate of the City of Mexico, which is one of the most unhealthy cities in the world. The fact that the city is six thousand feet above the sea level would seem to indicate that this should not be the case. The death-rate shown by statistics does not show the true state of things, because in that city many persons die and are buried without the knowledge of the Board of Health. One reason for its unhealthiness is that, notwithstanding that it is so high, and is not very hot, it does not possess an antiseptic atmosphere. This last may be explained by the fact of its being in a valley, and that the inhabitants receive all the sewage from the hills on each side. They are about to construct a tunnel under the mountains in order to get rid of this sewage. It is, however, typhus and smallpox, and not tuberculosis, which they suffer from.

My reason for speaking about the climate of the City of Mexico is to carry out what Dr. Solly said—that something besides elevation should be looked after in selecting a location for cases of tuberculosis.

Dr. Solly: Creosote has been said to disturb the stomach. I consider that all volatile oils are decided antiseptics. Oil of cinnamon is, perhaps, a better antiseptic than oil of cloves, but is not so well tolerated by the stomach. When I can get a person to take enough, so that I can get the emanations of it as soon as I step inside the door, I think I have done well.

Dr. Ingals: I cannot accept the statement of one of the speakers, that the effects of the change in the climate are purely mental.

I am satisfied that the carbonate of creosote can be taken in large quantities, if begun in small doses, and I believe that it yields about 84 per cent. of creosote. I have never used oil of cloves as an inhalant. I think that inhalations are of little value, excepting in so far as the remedies are absorbed into the blood, although they have some influence on catarrhal conditions of the mucous membrane of the trachea and larger bronchi. I do not expect to destroy many bacilli, locally, by inhalation. I am familiar with the views held by some, that antiseptics are advantageous only by improving the condition of the digestive organs, but from experience I fully believe that they have a much wider influence than is admitted in this theory. It is well known that healthy blood is one of the best bactericides,

but when the blood becomes much deteriorated it cannot destroy any considerable number of tubercle bacilli. Now, if in this condition, we introduce an efficient antiseptic, we may reasonably expect to increase the destructive quality of the blood upon microbes, and, therefore, so long as the disease is in the incipient stage and the microbes are not too numerous, we may hope to obtain positive benefit from antiseptics.

CHOICE OF A SUMMER RESIDENCE IN NEW ENGLAND.

By FREDERICK I. KNIGHT, M.D.,
BOSTON.

Within the recollection of our older members it was customary for most well-to-do people, those even who lived in large cities, to fit up their houses with shutters and awnings and make themselves as comfortable as possible at home during the greater part of the summer season; perhaps going away for a few weeks to Saratoga, White Sulphur Springs, or other such resort. The children were sent out early in the morning and put to bed in the middle of the day, and the whole family took to the front doorsteps for a breath of cool air in the evening. A few of the richer people had houses in the country suburbs of their own cities; but the establishment of a separate independent summer home, often at a great distance from the winter one, is a very modern practice. The dominant idea seems to be to escape the intense, exhausting heat of the cities and low inland country, and the entire New England coast and the best parts of its mountainous tracts are being rapidly pre-empted as cooling-off places for the rest of the country.

The places in New England which are resorted to on account of comparative coolness in summer present great differences of temperature, moisture, wind, and other climatic conditions. But little attention is, as a rule, paid to this fact, and a person goes to one place or another for no better reason perhaps than that a friend recommends it. A little thought or good advice in this matter would oftentimes be of great service, and even prevent serious consequences. Fashion has lately set the pace

to the seashore, but the seashore is by no means a proper summer residence for all people, and, furthermore, there are great differences in seashore places. The climatic conditions are typically different in different parts of New England. We find two kinds of country places appropriate for summer residence, viz.: places comparatively low in elevation, but far enough north to insure cool nights as a rule, and mountainous places which, according to their elevation, afford a dry, rarefied air, very free from germs, cooler days, and often very cool nights.

We find also several kinds of sea places differing greatly one from another, and indicated for very different conditions of the system. The coast climate of New England varies greatly according to the varying exposure to the south and east winds. To be cool in summer on the New England coast one must be where the south wind blows directly from the sea. As the general direction of the line of the east coast runs nearly northeast the whole coast would have the south wind from the water if it were not for the interference of the two capes, Cape Ann and Cape Cod. North of Cape Ann as far as Hampton, N. H., where the coast line begins to turn decidedly to the east, and north of Cape Cod, especially between Cohasset and Boston, the south wind comes overland, and is a hot wind; whereas, along the eastern Maine coast, north of Hampton, N. H., and south of Cape Ann toward Boston, on what is called the North Shore (*i. e.*, of Massachusetts Bay), including Gloucester, Manchester, Beverly, Marblehead, Swampscott, and Nahant, the south wind comes from the sea. As you approach Boston from Lynn the effect of the cape in meeting the south wind is felt, and at Boston it is a hot wind. On the south side of Cape Cod and along the southern coast of New England till it is modified by Long Island, one gets the south wind directly from the water. Everywhere north of Cape Cod the coast is exposed to the east and northeast winds, which may be very cold and raw. The shores of Buzzard's Bay are shielded from the east winds by Cape Cod, and Newport and New London receive the northeast wind modified by the same

The temperature of this region is consequently more equable. While the Beverly shore and the shore south of Cape Cod have the common advantage of being cooled by the south wind direct from the sea, they differ much in other respects. The air of both regions is moist, of course, but that of the Beverly shore much colder. We all know how different the effect of cold and warm moisture is, especially in affections of the respiratory and nervous systems. The wind south of Cape Cod blows quite steadily from the sea, so steadily and strongly as to be physically disagreeable to some people.

We have also the island resorts, where the quality of the sea air is experienced more constantly and the temperature is more equable, but which differ considerably, one from another, in average temperature. The Isle of Shoals is much cooler than Block Island or Nantucket.

If all the members of a family are robust and free from individual contraindications it will in general be found best for those who spend most of the year inland to go to some part of the seacoast for the summer, and for those who live on the shore to go inland or to the mountains. It will be seen, however, that I have mentioned three kinds of resorts by the sea:

1. The Maine coast and the Beverly shore.
2. Shore south of Cape Cod.
3. The islands,

and two in the country:

4. The mountains.
5. Country not much elevated, but quite far north.

There is often an opportunity for the medical attendant to be of great service to a family in indicating their summer residence, perhaps in reference to their characteristics as a family, or with special reference to an invalid or convalescent member. He has to choose between the simple air of the north country, the stimulating, rarefied air of the mountains, and the pure ozone-laden sea-air; but here again he must choose between the island climate, the cold, stimulating air of the Beverly shore and the Maine coast, or the warm and, to some, enervating air of the south shore.

It is not my purpose to-day to go over again the different diseases and conditions of the system in which these different climatic conditions are indicated; this has been often done, but simply to call attention to their existence, especially those along the New England coast, in regard to which the people, and often their physicians, seem to be unusually ignorant.

DISCUSSION.

Dr. Bowditch: It was very interesting to me to hear Dr. Knight's remarks on the climate of New England, emphasizing the differences between the so-called "southern shore," on the south side of Cape Cod, and the Maine coast. I can speak from experience of the enervating effect of the coast, especially the island portion of Maine. Another feature of the southern shore is the extreme moisture, from which boots and shoes are found to be mouldy after a short stay. On the northern coast, it is rare that boots will be found to be mouldy after a whole summer's sojourn there. Another peculiar characteristic of the Maine coast is the often dry character of the fogs. It may at first seem a misnomer to speak of a "dry fog," but any one who has been in that region will understand what I mean. The light vapory mist which drives in frequently from the sea has no definite sense of moisture as it strikes the face, and in the midst of it the air frequently feels dry. Often I have seen clothes hanging out and drying during such fogs. They are in marked contrast to the drenching fogs of the "south shore."

The difference between the coast of northern and southern Massachusetts Bay is also quite marked, the line being easily drawn through Boston from west to east. At Cohasset and Nantucket, just south of this line, during the prevailing southwest wind in summer, the heat is often intense, as the wind comes over the land; whereas just north of this line, as the breeze comes more over the water, it is much cooler.

Again, on the coast of Maine, the southwest wind, which in Boston has a debilitating, blustering, muggy quality, is delicious in its cool, bracing, and even dry quality, as it comes over the colder waters of that shore. This is especially noticeable on the islands along the coast, and the climate generally has more of the typical equability of island climates. The snows in winter are not so deep and do not last so long as on the mainland. In the vicinity of Mount Desert, the

presence of the mountains there has, doubtless, an effect upon the quality of the atmosphere, and would partly account for what is often spoken of—the effect of sea and mountain air combined. Its peculiar dryness, even though on the coast, has been often so marked that I have frequently thought that certain phthisical patients, who need a dry, bracing atmosphere, might improve there, although I have never quite dared to recommend it for such cases.

Dr. Solly: I was glad to hear Dr. Knight tell us of the characteristics of his home climates. It is a great treat when we can listen to a man who thoroughly knows the subject he is talking about. We practitioners in Colorado often find it advisable to send our patients east during the summer, and, therefore, desire aid in selecting eastern climates. I was struck last year by the difference in the humidity of the air of the New England seashore and that of the high ground inland, by noticing that my clothes which I had packed up one morning damp at East Gloucester, where the weather was clear, sunny, and without fog, dried out in the night at Princeton (Mass.), the windows being open all night, although, when I awoke in the morning, there was a mist lying low on the ground. Such points as the differences in the climates of Nantucket and the Isle of Shoals are exceedingly valuable. I find climatic study of New England, as, indeed, of most countries, much circumscribed by the absence of meteorological data.

Dr. Alton: I think we all appreciate the courtesy extended to the visitors of this Society in allowing them to participate in these discussions and to engage in this study of climates and localities. It has long been my observation that there has been too much generalizing in the matter of climate. We are, therefore, indebted to Dr. Knight for his altogether too brief paper on the subject of the New England coast resorts. On visiting Nantucket some years ago I carried with me the supposition that it might be an excellent place for cases of tuberculosis, but I found that, both among the natives and among visitors, there were numerous deaths from that disease. I did not quite understand this until I began to appreciate some of the local features of the island and its meteorological phenomena as compared with the northern coast resorts. This shows how careful we should be to study the minutiæ of localities that are approximate. We often find physicians sending their patients to California. Not being directed to any particular part of that State, they choose their own locality, and soon need to seek another residence on account of the unsuitability of the one first selected. In one locality they succumb to malarial fever; in another they suffer from rheumatism, and in a third they die from ennui, showing the need of adapting climatic features, not only to pathological condition, but to physical dyscrasia and the personal characteristics of the individual. I have

visited patients sent into the Adirondacks without any definite directions as to locality, living in a close, hot, hotel room, where they certainly should not have been. I know places in these same mountains where they could sit out on the veranda during a heavy rain without feeling any moisture. But there are also places where, especially in the valley of some attractive stream—spots so often sought for camping out—moisture emanates from the cold, damp soil, and the atmospheric conditions differ materially from locations exposed to drying winds and an all-day sun, and with a rocky or gravelly soil. I quite agree that there are certain localities where the fogs are damp, and it is often this very dampness that defeats our purpose. If we select another point quite near, we shall find there is less moisture, permitting that out-of-door life so essential to treatment. We should, therefore, take up the details of climate as we find them locally, and bear them in mind when selecting the proper resorts for our patients.

Dr. Babcock: What I was especially struck with in the paper just read was some of the statements concerning the tonic and bracing climate of Maine. There is no doubt of this, yet, in thinking upon it, I recall some statistics given to us by one of my professors when I was a student. He had found tuberculosis most prevalent in Maine and adjoining States, and that it diminished as one came southward along the Atlantic coast and southwest; and I wondered why tuberculosis shonld be so prevalent in Maine if the climate of that State was so tonic and bracing. I concluded that it must be due to the long winters and comparatively short summers, and the consequent inability of the inhabitants to spend much time in the open air; this brought me to the reflection that, if we are to send tuberculous patients away for the summer, or patients who have an hereditary tendency to tuberculosis, we, of course, should send them to climates that are stimulating and bracing, and where they can remain for a great part of the time in the open air, otherwise no benefit will be derived. I think that this simply emphasizes the truth of the principle that it is life in the open air that cures our tubercular patients, and that, however fine the climate, the consumptive will not recover unless he spends his time out of doors.

Dr. Bowditch: When I spoke of the climate of Maine I was speaking of its climate in summer. The tubercular disease among the women of that State may be accounted for largely, I think, by their habit of huddling about air-tight stoves in the long winters, and never going out. As a matter of fact, the existence of tuberculosis is very rare among the inhabitants of the islands. Most of the men lead hard fishermen's lives, exposed to the severest kinds of weather; but tuberculosis, according to my observations, is rare there.

Dr. Taylor: I, myself, am a Maine man in summer. I have looked up the subject very carefully and found that, as a matter of fact,

tuberculosis was very prevalent some years ago, and a great many people thereaway died of it. But that is now a matter of past history. It is no longer so prevalent or deadly. I think that its prevalence was, in part at least, due to the insufficiency of the food in quantity, quality, and preparation. Since that time these conditions have astonishingly improved. In my hunting trips I have seen quite a good deal of this sort of thing, but it is now disappearing. Its former prevalence, as Dr. Babcock has said, was due to the inability of a certain class to spend much time in the open air, especially in bitterly cold winters. The question of a choice of a summer residence is an interesting one. The atmosphere along the coast is not dry, only relatively so. The coast line of Maine is enormous. If all the indentations were straightened out into one line, that line would be 6000 miles long. It is true that we have what are called dry fogs, during which we can scarcely notice any dampness, although they obscure the view; the moisture of fogs varies exceedingly.

I have been studying the effect of an ideal form of climate where we can get an inland lake, near but somewhat removed from the sea, because the climate is likely to be a dry one. The air is less subject to sudden chills, and yet it has sea elements.

I have among my patients a good many neurasthenics and also a good many persons who are suffering from rheumatism or its effects; and I consider the most perfect climate for them is to be found in some such places as those which I have seen where they can get the peculiar combination of sea and mountain air on a lake surrounded by conifers.

Dr. Knight: The coast of New England is not to be recommended except in summer and early autumn. Regarding the prevalence of consumption, it does not exist until introduced. No climate could be more favorable for the spread of pulmonary tuberculosis than that of Iceland. They have none now, but if it once got a foothold there it would make fearful ravages. Tuberculosis is diminishing among the native population in New England, as in old England. The mortality rate is kept up in New England by the ingress of people of other nationalities.

Dr. Quimby: Interesting and instructive as these discussions are, it seems to me that we are running too much to discussions. By taking up so much of the time we are crowding out papers which have been prepared with much care by other members, while our remarks have not had the same care in preparation, and, therefore, cannot have the same value. I move that the remaining papers shall be read in sections, according to their subjects, and that each section of papers shall be finished before the papers composing it are discussed. This will, also, give each person a chance to prepare the remarks he wishes to make in the discussion. I move that the time for discussion be

limited to three minutes for each member. The first set shall be composed of Nos. 3, 4, 5, 7, and 8, all of which treat of climate in general. The second set of Nos. 9, 10, 11, 12, 13, 14, 15, 16, 17, which are upon the general subject of lung disease. All the other remaining papers shall constitute the third set, which refer to various other subjects not embraced in the other two sections. (Motion seconded; carried.) [In publication it is deemed best to rearrange discussions.]

RENAL DISEASES AS AFFECTED BY CLIMATE.

By I. N. DANFORTH, A.M., M.D.
CHICAGO.

THE relations of climate to renal diseases seem to have attracted but comparatively little attention, although the subject is one which obviously has a very great practical importance. It is quite remarkable how little is said upon the subject of climate as a cause of or remedy for renal diseases in the varous text-books and monographs wherein Bright's and allied diseases are discussed. Yet they are not altogether silent.

R. Saundby[1] attributes the prevalence of Bright's disease in "Holland, Denmark, Scandinavia, and on the shores of the Baltic, to common predisposing cause—a cold, moist climate," and Garrod explains that "chilling the skin increases the formation of uric acid, while it probably gives rise to other alterations in the blood by diminishing elimination."[2]

H. B. Millard[3] states, with reference to the "Causology" of chronic croupous nephritis, that "it appears to be the same as that of many cases of chronic interstitial nephritis. The most prominent of these causes are undoubtedly atmospheric conditions, damp, cold, unfavorable climate, check of perspiration, etc." It will be observed that this author regards "unfavorable climate" as capable of causing both croupous and interstitial nephritis.

Grainger Stewart is silent as regards climate as a cause of renal lesions, although he recommends patients to winter in the "South of Europe, in Algiers, or in Egypt, and practi-

[1] Renal and Urinary Diseases, p. 89.
[2] Op. cit, p. 119.
[3] "Bright's Disease," p. 94.

tioners in high altitudes, such as Davos, find that renal cases should not try treatment there."[1]

W. H. Porter has nothing to say regarding climate as a cause of or remedy for renal affections. C. W. Purdy[2] says: "All renal diseases are influenced by vicissitudes of temperature and humidity of the atmosphere, and these are found most injurious in the cooler ranges, such as the temperate zone between the fortieth and sixtieth parallels." Furbringer does not attribute much influence to climate in the causation of Bright's disease. J. Tyson regards a malarial climate "as a recognized cause of chronic parenchymatous nephritis." Charcot and George Johnson are both discreetly silent in respect to climate as a cause of or remedy for Bright's disease. W. Howship Dickinson, in his classic work on *Albuminuria* (p. 280) presents the most extended article on "Climate in Relation to Renal Disease" with which I have met. His article is based upon the *Army Medical Reports* of Great Britain. "Our military posts" (*i. e.*, those of Great Britain), says Dickinson, "are ranged like sentinels around the world; and extending from the Arctic circle to the Equator, and thence far toward the South Pole, they are exposed at the same time to every climate and every season. To these local influences we subject, with all the exactitude of scientific experiment, bodies of men of the same race, age, occupations, and habits, each with a staff of trained observers, and a uniform system of recording the issue." The author finds that the "equatorial districts of Ceylon, Japan, the greater part of India and China all give a large proportion of renal disease;" but, as might be expected, it is mostly of the *amyloid* or *lardaceous* variety—degenerative, rather than inflammatory lesions, being far more common among Europeans transported to tropical regions. It is noteworthy, also, that syphilis, one of the most frequent causes of amyloid kidney, is especially prevalent in the tropics—a fact which detracts somewhat from climate *per se* as the essential cause of amyloid disease.

[1] Lectures on Albuminuria, p. 219.
[2] Bright's Disease and Kidney Affections, p. 145.

The United Kingdom shows an equal prevalence of Bright's disease, but it is mostly of the cirrhotic or gouty form, as might be predicted from the moist and fickle climate and the habits of the people. So, too, British America, whose latitude does not essentially vary from that of Great Britain and Scotland, presents about the same average prevalence of Bright's disease, but the type again changes to "parenchymatous" or "tubal" nephritis, owing doubtless to the prevailing low temperature, deep snows, and consequent long periods of humidity.

It is an interesting illustration of this theory, that Newfoundland, with its excessive humidity, presents the highest percentage of the parenchymatous form of Bright's disease.

With the higher temperature of New Zealand renal disease becomes less frequent, and is at least so upon the sub-tropical shores and islands of the Mediterranean and the solitary outposts of Mauritius and Bermuda, where a tropical or nearly tropical climate is tempered by a vast circumference of ocean. In the sub-tropical range, which is thus comparatively exempt from renal disease, lie the Cape and St. Helena, which are, on the whole, lightly affected. Notwithstanding the prevalence of syphilis at these stations, the tables showing the actual proportion of death from "renal disease" in Great Britain compiled by Dickinson, have little practical value, because "renal disease" is quite too flexible a term for scientific purposes. It is necessary that we should know exactly what form of "renal disease" is developed by a given climate or locality before any conclusions can be drawn which amount to anything from a scientific standpoint. The conclusions which the author deduces from his investigations, and which seem well founded, are the following:

1. Lardaceous or amyloid disease of the kidney is the type most prevalent in the tropical regions, partly as the result of the "disorders which the tropics entail upon the Europeans," partly because of the excessive prevalence of syphilis and its miserable treatment by the native practitioners. (If the latter part of this theory be true, lardaceous disease ought to

diminish as the knowledge of medicine increases among the Oriental natives and the treatment of syphilis comes to be more satisfactory.)

2. Other forms of Bright's disease, namely, *parenchymatous nephritis* and *interstitial nephritis* "belong especially to the temperate zone and to its colder districts." They lessen as we approach the equator, but they lessen still more as we proceed northward from the temperate zone until, as we reach the frigid regions of the north, renal diseases are almost unknown. It is a curious and instructive fact that Arctic explorers, from the days of Sir John Franklin, have been singularly exempt from renal diseases. My friend, Dr. Jacob F. Holt, of Philadelphia, who was surgeon to the first Peary expedition in search of the illusive North Pole, informs me that not a case of renal or urinary disease appeared among the officers or crew of the vessel to which he was attached, a fact which he and others think is due to the increased demand upon the respiratory function for the purpose of maintaining body-heat. Exposure to extreme cold creates a vigorous demand for the fatty foods, to the exclusion or reduction of flesh-diet, such as steak, chops, and roasts. Hence the kidneys are relieved of the work of eliminating nitrogen; but the lungs become the theatre of fierce combustion, that the heat of the body may be maintained in the midst of Arctic snows and a temperature 40° below the zero of Fahrenheit.

If we turn to the tropical regions again, we find also one explanation of the absence of renal diseases in the comparatively slight consumption of nitrogenous food. Fruits and cereals are the chief foods of the Oriental, his aim being not to increase body-heat, but to reduce it to the minimum. Hence the kidneys are not taxed with surplus work, and parenchymatous and interstitial forms of nephritis are so rare as to be curiosities.

In the temperate zones all this is changed. The more vigorous races of these regions, with their high-strung nervous systems and restless brains, which constantly impel them to attempt more than they can safely perform, demand a diet

which is largely nitrogenous. It is the prevalence of meat-diet, especially its excessive consumption, in the temperate zones, in my judgment, which accounts for the frequency of Bright's disease quite as much as the climate. It is, indeed, true that the climate—which is a constant stimulant—renders nitrogenous diet necessary ; but it does not render its excessive consumption necessary; and my own experience teaches me clearly enough that a restriction of meat-diet lessens the liability to inflammatory lesions of the kidneys.

Speaking from my own personal experience and observation in the field of renal pathology, and especially with reference to the parenchymatous and interstitial nephritis, I am convinced that the former is not infrequently a product of malarial poisoning. I have seen cases repeatedly which I felt constrained to attribute to repeated or habitual exposures to malarial effluvia, and which I could attribute to no other cause. Many of these cases gave distinct histories of repeated malarial outbreaks of a tertian or quartan type, and admitted repeated visits to localities reeking with paludal poison.

In one case I found the plasmodia of A. Laveran, together with a well-marked malarial "cachexia," decided albuminuria, hyaline and epithelial tube-casts, and œdema of the feet. All these symptoms disappeared under the use of quinine (18 grains given every forenoon in three equal doses), and the patient remains well at this time, six months having elapsed. It is not impossible that many of the cases loosely attributed to "cold and wet" may really be due to malaria. A question of great interest is how tubal nephritis is produced by malaria. A very rational explanation is that it is due to the irritant effect of the plasmodia themselves upon the renal tubules or their epithelia. But this is conjectural, as I have never had the opportunity of examining a kidney in a case of malarial nephritis.

I have not been able to collect any trustworthy evidence as to the causation of interstitial nephritis by climatic changes, although I have sought diligently for such evidence. Plenty of cases have presented themselves in my consulting-room and

at my clinic, which might upon superficial inquiry have been attributed to peculiarities of climate or environment, but a more careful and searching investigation has revealed other causes, such as errors of diet, overwork, intemperance, etc., so that climate could not, with anything like scientific accuracy, be regarded as the efficient cause.

The curative effect of a uniformly warm, dry climate, which is free from paludal poisoning, is unquestionable. I have seen the beneficial results of a residence in Algiers, the south of France, Northern Italy, Barbadoes, and the Indian Peninsula time and again. Our own Southern States are equally beneficial in localities where the moisture is not too great, but thousands of acres of virgin soil must be subdued by cultivation, and thousands of other acres of cypress swamps must be drained before patients can be sent to *our* South without a careful discrimination as to time and locality. The south of Europe has been subjected to hundreds of years of close and severe cultivation, so that the sources of malarial poisoning are few and far between. Our "Sunny South" needs just that treatment to render it a salubrious and curative climate for Bright's disease, except in favored localities which have already been passed through the early stages of civilization and cultivation.

CLIMATE OR ENVIRONMENT AS A FACTOR IN THE REPAIR OF NEURASTHENIA AND MELANCHOLIA.

By JOHN MADISON TAYLOR, A.B., M.D.,
PHILADELPHIA.

THERE is a strong belief prevalent among the profession of medicine and the laity alike, that climate exerts a marked influence for good or ill upon persons suffering from brain-fag, nerve-tire, and melancholia. It is my desire to call attention to the subject before this experienced body of widely scattered and acutely observing medical men, especially familiar with climate and its effects, which I hope will provoke a discussion and bear fruit now or a year hence, when I propose again to repoen the matter. If one or another climate does help or hinder these sufferers, it is important to know the fact and accumulate and sift the evidence; to note the effect of altitude, sea-level, heat and cold relations, humidity, winds, and the like, characterstics of soil, flora, and whatever factors go to make up that subtle entity, a suitable dwelling during special forms of debility.

The writing of climatologic experts has hitherto been directed almost exclusively to the needs of sufferers from pulmonary, asthmatic, rheumatic, or other sensitive ailments. The martyrs to these ills have superadded not seldom the complicating factor of neurasthenia, and it would be instructive if these could be differentiated and considered separately. However this may be, one fact is thrust upon the attention of American physicians obstrusively: the increasing number and complexity of instances of exhaustion, with will-loss or impairment, mental depression and other effects of modern

hurry, strains, responsibilty, coupled with excesses of various sorts, not always intrinsically reprehensible, oftentimes praiseworthy, accidental or inevitable. A large part of these persons refuse systematic medical treatment, but are quite willing to "try a change of climate," which they often prescribe for themselves; they act during their wanderings as they choose, seldom wisely, and return when it is convenient, or make such changes as fancy or whim may dictate. It is worse than unfortunate that the public are guided less than they were by medical advice in these matters, valuing the opinion of a presumably skilled and learned professional man less in matters of general conduct than the views of clergymen, who are so often valetudinarians trying a new region each summer, or the ideas of accidental acquaintances. They talk a vast deal of rubbish on their return about their experiences and conclusions. We medical men thus suffer in our dignity and influence, and the public make a lot of blunders oftentimes most disastrous for themselves. However, it is our own fault largely, and this we should seek to remedy, first, by being at greater pains to know, and secondly by giving definite, clear, and forceful reasons for our opinions. We really know very little of the climatic possibilities of America, and as to those of Europe we are guided chiefly by hearsay or ancient precedent. It is not permitted the average medical man to roam for his own instruction among health resorts, and when he turns to literature he is too likely to find interested plaudits based upon reasons more or less commercial. We, then, need most conspicuously, formulated information as to our own climates. This knowledge is, however, growing steadily, thanks largely to the efforts of this Society. It would be greater if concerted effort in the search for and interchange of opinions were more systematic and frequent.

I personally have been fortunate in seeing a large number of health-resorts in four continents, and am thus enabled to form some opinion as to their charm and especial equipment. Also, I have been enabled to judge somewhat of their suitability to

the class of cases under discussion, because my experience of these localities has been largely on account of certain sufferers from nervous disturbances with whom I was thus travelling. I offer here, for comparison with the views of others, a few conclusions from this and also a pretty large subsequent experience gained at second-hand from patients of my own, and also from the nurses or attendants, upon whose conclusions I am much more apt to depend. One fact stands out more boldly than any other. Environment is, for these folk, of far deeper influence than locality, and as the first factor is always much more controllable than the latter, upon it the medical adviser must chiefly depend in the majority of cases. Environment includes many important things, the first of which is suitable companionship, most often solved by a proper paid attendant, preferably a skilful and tactful nurse. With such a companion it is not necessary, often objectionable, to stir far from home. Plenty of places can be found within a few miles of one's own residence admirably adapted to all reasonable requirements. Then, if from home, there follow a number of desiderata connected with creature comforts which are often interpreted by the patient to mean palatial hotels of mammoth size with a bewildering array rather than special suitability of dietary. However, even herein a judicious selection need not go amiss, the province again and duty of one other than the patient.

There are doubtless many advantages to be claimed for radical geographical changes, escape from a cold winter being one of the most conspicuous and popular. The warmth and sunlight of subtropical regions afford opportunity for outing which cannot be gainsaid; but it is a question whether the reversal of the seasons is so well for those who are lacking in vascular and nervous tone, for whom cold, under suitable precautions, is an invaluable tonic. Indeed, I have repeatedly seen evil effects, lack of gain and changes for the worse, from the occasional excessive heat and emasculating softness of the sunny South. I accompanied a gentleman to the tropics, whose trouble was the result of simple protracted overstrain, who

suffered intensely from the enervating qualities of the heat and lifeless air. A change to a cool hill country, where we kept busy and active in a simple physical way, wrought a notable improvement. And so it often is, the inaction of unseasonable heat, theoretically restful, is galling to an active mind and body, which require a change of form in the lines of normal impulses rather than a checking off of these, or an enforced inactivity induced by depressing heat, which so frequently occurs in subtropical winters. Again, it is a great evil for the physician to assume that because he personally happens to enjoy the seacoast, and himself sleeps well when there, that a man, all tingling with jaded and irritated nerves, and sleepless from worries and hyperæmic brain-states, must also be similarly benefited. The small repeated noises which make up the roar of the sea are sometimes revolting to such sufferers. There is also another element in seashore air—the small repeated concussions on the eardrums caused by the ceaseless beat of air-waves; also a certain vibratile influence, due to the beat of the surf on the shore, which the patient also shares, possibly, by a species of bone-conduction to the brain. All these are small points, it may be, but in the aggregate most unpleasant. Many persons are persistently sleepless at the seaside; some, indeed, are never well when on the surface of the sea, though not actually nauseated. They suffer from sea dyspepsia. I have an intimate friend who was retired from the navy because of an unconquerable inability to digest while on board ship, although never seasick.

Mountains, again, are charming to see and invigorating to climb, but to remain long in high altitudes occasionally produces harmfulnesses, especially to those lacking in vascular tone. The nervous distress due to aërial rarefaction is recognized, though perhaps not yet fully understood. As a rule, it seems to me high altitudes aid apathetic states, and are liable to produce restlessness in irritable folk.

Let me call attention finally to the great unwisdom of allowing a sufferer from the effects of diseased impulses to rush helter-skelter from place to place, like the dove when she

escaped from the ark, ever seeking rest, and finding none; or, *per contra*, the sufferer from will-loss, who becomes apathetic or melancholic, choosing obstinately to stick in one spot into which he may drop by accident, declining to budge unless forcefully urged to do so on rational grounds or pure and simple domination.

THE INFLUENCE OF CLIMATE IN NERVOUS DISEASES.

By SANGER BROWN, M.D.,
CHICAGO.

By the term climate is understood certain conditions of temperature, weight, moisture, and movement of the atmosphere, together with the presence in it of such substances as iodine, ozone, and balsam, which are more or less predominant in certain portions of the earth's surface. Variations in these conditions produce a corresponding variation more or less pronounced and uniform upon the functions of animal life.

Some consideration of the factors which have to be reckoned with when the effect of climate upon the bodily functions is estimated logically precedes a discussion of its influence in nervous disorders. The effect of passing from a cool to a hot climate has been pretty thoroughly studied by British physicians, who, on account of the troops and civilians exchanging a residence in England for one in India, have been afforded peculiarly favorable opportunities for investigation. There is a reduction in the respirations from 16 to 13, or even less, accompanied, however, by a slight spirometric increase; this spirometric increase, though, does not compensate for the diminished number of respirations, as the respiratory function undergoes a reduction amounting to nearly 19 per cent. The lungs of Europeans in India are lighter after death than the European standard—that is, they contain a larger proportion of air and a smaller one of blood. The digestive powers are reduced, the craving for animal food diminished, the nervous system is depressed, and specially so if great humidity be combined with great heat. Great heat in a dry atmosphere is

well borne for a time; but if protracted, an impairment of nervous energy results, accompanied by a corresponding lowering of the functions of digestion, respiration, and assimilation, and signs of premature age make their appearance. It is only necessary to mention heat-stroke in this connection.

The effects of extreme cold upon the nervous system, as observed by Arctic explorers, are highly interesting, but not of great practical importance from a climatological standpoint. However, it is a matter of common observation that a dry, cold atmosphere has an invigorating effect upon the nervous system, and consequently upon the system generally. A considerable diurnal change of temperature is invigorating to the nervous system, providing the upward curves do not range too high. In New Mexico, Arizona, and Colorado would be found almost any degree of daily fluctuation desired. It is well-known that many people of unstable nervous equilibrium, whether such instability be temperamental or whether it be developed by such a natural crisis as puberty or the menopause, or whether it be the result of overtaxing the nervous system, or due to the debilitating effects of such a disease as consumption, present signs of marked nervous disturbance when they pass from a low to a high altitude. Some of the more prominent symptoms are general restlessnes, an anxious expression, insomnia, and tinnitus. My personal experience and observation are limited to a few months' residence in El Paso, with an altitude of 3000 feet, and Santa Fé, with an altitude of 7000 feet. At the former I saw no cases of this kind, while at the latter they were comparatively frequent. Some of the severest cases were presented by tourists who had planned to spend a few days or weeks at the hotel, but who were reluctantly compelled to cut their visits short and seek a lower altitude. I believe it is almost wholly on account of these nervous disturbances that so many cases of tuberculosis, in the earlier stages, at least, do not do well when sent directly from a low to a very high altitude. The symptoms would appear to be more probably due to some stimulating properties in the air than to a diminution of pressure, inas-

much as almost identical, though much less frequent and less pronounced effects, ensue when an inland dweller goes to the seashore.

While the effect produced on the nervous system by too rapidly reduced atmospheric pressure, when it had been increased three or four atmospheres, as is done in caissons, is of great importance, it has no application here, neither do the symptoms presented by those who take a very high balloon ascent. A dry, cold, sunny climate, not too windy, and with an altitude not above 3000 feet, is the one best suited to the restoration of a debilitated nervous system, no matter hardly to what cause this may be due. If proper precautions are taken in regard to the clothing, and the kidneys are sound, a very frail, nervous invalid may spend hours daily in the open air, even in a cold winter climate with manifest advantage. If the cough were not thereby aggravated, I believe many cases of phthisis would be best treated along these lines, for more can be accomplished in arresting the disease by raising the functions of the nervous system to a high point than in any other way, though, of course, I do not deny the beneficial influence of an atmosphere in which putrefaction cannot take place. When it is remembered what a sharp decline there has been in the mortality from consumption in the various armies since the ventilation of barracks has been attended to, it might be maintained that the prevalence of this disease among the inhabitants of certain cold countries was mainly due to their spending months together in filthy huts without ventilation, and not to the low temperature. The inhabitants of New Mexico, who are comparatively free from this disease, live almost entirely in the open air, there being so much sunshine, the diathermancy of the air being so great, and fuel so scarce, that the use of fire is mainly restricted to cooking.

There is much to be said, I think, in support of the position that nearly all diseases which are benefited by climate owe the improvement largely, if not mainly, to the effect produced upon the nervous system. It is not claimed that

climate has a direct influence on any of the organic nervous diseases, nor yet upon such functional diseases as paralysis agitans or epilepsy. It is really only certain forms of functional nervous diseases that demand attention in this connection, particularly those forms of functional disorder which come to those who overtax themselves in trying to bear the burdens and stand the strains incident to a civilization with rapidly increasing complications and responsibilities. It is manifestly upon the upper strata of the middle classes and the higher classes that these burdens of responsibility mainly rest; they furnish a large proportion of the more serious or severe cases of these forms of disease, and they, too, are usually able to afford the means necessary to properly test the effect of a change of climate. Some of the principal symptoms of these cases are insomnia, mental depression, irritability, emotional disturbance, inability to sustain mental effort, neuralgia, headache, vertigo, dyspepsia, and constipation. Though there is undoubtedly marked individual differences in the original strength of the nervous system, the cause of the trouble in these cases may be regarded as extrinsic, while the familiar nervous manifestations appearing at the period of puberty and the menopause may be regarded as intrinsic.

Benefits derived from a temporary change of climate are due:

1. To incidental influences, such as relief from responsibility, change of scene, an outdoor life, and regular habits.

2. To the influence of the climate in the promotion of the general health.

3. To the direct effect of the climate upon the disease itself as to the healing influence upon the lungs, popularly attributed to inhalation of the atmosphere of certain districts.

1 and 2 are much more important than 3, even in pulmonary tuberculosis, for unless they act the disease invariably progresses.

In functional nervous diseases, referred to above as extrinsic, more than in any other, perhaps, are influences incidental to

a change of climate important. Cares and responsibilities are left behind, the mind diverted by a change of scene, there is likely to be some change in the diet, the habits are regular, and there is an outdoor life.

That the influence of climate in the promotion of the general health is of the utmost importance in all diseases susceptible to benefit from climatic treatment needs no argument.

While it is not claimed that the direct influence of climate in nervous disease is by any means as great as the healing effect upon the lungs popularly attributed to inhalation of the atmosphere of certain districts, yet even in cases of incipient pulmonary tuberculosis the condition in which the direct effect of climate sometimes produces its most brilliant results, if the patient does not take kindly to the incidentals, such as separation from friends and previous modes of life; in short, if there is much antagonism from the nervous system, he will almost certainly grow worse, the inhalation of salubrious air notwithstanding.

I have said that various forms of functional nervous disorder are sometimes made worse by sea air, but this aggravation is much less frequently seen here than in high altitudes; indeed, a large majority of nervous invalids do well at the seaside, and if at first the air is too stimulating, later they may be greatly benefited by it. Even a sea voyage or a sojourning in a high altitude may be productive of the best results.

In all cases where recuperative power is greatly impaired, either by age or disease, caution has to be observed in sending the patient to a cold climate; but I am strongly of the opinion that many cases of nervous disorder such as I have described are sent to a warm climate who would do much better in a cold one.

CLIMATE IN ITS RELATIONS TO DISEASES OF THE NERVOUS SYSTEM.

By DANIEL R. BROWER, M.D.,
CHICAGO.

Climates have curative relations to diseases of the nervous system undoubtedly as important and surely as difficult in determining as those that pertain to the relations of climate to other diseased conditions of the body. For the purpose of its consideration we may divide climates, as is ordinarily done, into (1) marine; (2) low level inland; (3) high level inland.

The marine climates, characterized as they are by purity of air, equability, large amount of moisture, abundance of light and ozone, high barometric pressure and minute quantities of chlorides, bromides, and iodides in the air, are in their general effects on the nervous system sedative and tonic, in suitable cases quieting nervous agitation, relieving insomnia and improving the appetite. A low-level inland climate is simply tonic to the nervous system without any special sedative or stimulating effect. The high-level inland climate, with its purity of atmosphere, its diminished average temperature, its high temperature in the sun, and low temperature in the shade, its low barometric pressure and rarefied air, its greater diminution in absolute humidity, high electrical tension and increased quantity of ozone, is stimulating and tonic in its effects upon the nervous system, and is indicated where we seek to produce greater activity in the nerve-forces, to relieve insomnia, to promote the appetite, increase the activity of the skin, and strengthen the heart and vascular systems.

Insanity. Beginning by considering the gravest form of

nervous disease—insanity—there can be no question that some cases are very much improved by proper climatic conditions, but there is some difficulty in selecting a climate for this complex condition of the nervous system even greater than for cases of tuberculosis. As a better knowledge of insanity is being diffused throughout the profession, a greater number of cases will be treated in private houses, in the homes of physicians and in ordinary hospitals, and this will give a better opportunity to obtain the modifying influences of climate in the disorders of nutrition that have developed this special form of nervous disease. There has been in times past too great a tendency on the part of the family physician to hurry off a case of insanity to the nearest and most readily accessible insane hospital, without properly considering the relations that climate may bear to this grave disorder. In the simple form of melancholia a moderately high altitude inland, because of its stimulating and tonic properties, is of service, especially in those cases that have originated in low-level and marine climates. In the treatment of this form of insanity, as in the treatment of insanity generally, it has been my practice as far as possible to move patients from one institution or hospital to another, if the improvement has not been satisfactory or if it has not commenced, and I have frequently seen a stationary case urged on to improvement and to recovery by a change in locality when the equipment of the institution may not have been even as good as the one from which the case has been removed. Slight modifying conditions are sometimes sufficient to turn the tide in this subtle affection from or toward recovery. It is unfortunate that there are so few private hospitals for the insane located in moderately high level climates. In the incipiency of these cases of mental depression there is some advantage in travel with a well-selected companion in the climates indicated, such as the White Mountains, Adirondack Mountains, the mountains of Virginia and of North Carolina. In the mountains of North Carolina the conditions are favorable not only for the summer, but for winter residence in the neighborhood of

Asheville and Linville. The latter is especially a very desirable locality. The Ozark Mountains and the lower levels in the Rocky Mountains—any one of these localities well representing the stimulating and tonic properties of elevation—and the patient may be moved with advantage from one place to another, securing thereby mental diversion and a possible relief from the constant tendency to introspection. In the agitative form of melancholia, as well as in cases of mental exaltation, better results will be had in a low-level or marine climate. The sedative and soporific effects of a lower level or marine climate are indicated in these cases, and the coasts of Southern California, New Jersey, Long Island, Massachusetts, and Maine offer many localities specially well suited to this form of insanity; fortunately, in most of these several localities there will be found excellent private institutions for the care and treatment of insanity. The milder cases of these forms of mental disturbance may be treated successfully in these several localities with the aid of a competent nurse or a travelling companion.

Neurasthenia. The special and visceral forms of this commonplace disease do best, as a rule, in a marine climate. Indeed, a sea voyage in a slow sailing vessel is often of the greatest service, and a locality in a favorable marine climate, such as southern Spain, Algiers, the Riviera, Italy for the winter, Holland, the coast of England, Ireland, and the coasts of Norway and Sweden for the summer. The cerebral form of neurasthenia, as a rule, does better in an inland climate, and one of the best in the United States is Saratoga Springs, New York, especially with those cases that have marked insomnia, constipation, and uricacidæmia, as so many of these cases have. The climatic conditions at Saratoga are eminently conducive to sleep. The Congress and Hathorn waters are excellent laxatives, and the Vichy water a corrective of the uric acid diathesis.

In cerebral neurasthenia, with no marked disorder of the circulatory system, the bracing air and the abundant sunshine of the Rocky Mountains are often highly beneficial, especially

Colorado Springs and Manitou, Southern Dakota, New Mexico, and parts of Old Mexico, such as Guadalajara, or Orizaba and Monterey, will give relief to many of these cases.

NEURALGIA. In selecting the climatic conditions to influence the course of neuralgia the etiology is the key, and in its climatic bearings we have to consider rheumatism and gout, syphilis, anæmia, neurasthenia, and malaria. For the gouty and rheumatic neuralgias the essential climatic conditions are warmth, dryness, and sunshine, and we can usually find such conditions in Southwestern Texas, the inland regions of Southern California and Southern Dakota, and occasionally these patients do well in moderately moist localities, such as Asheville, Aiken and Thomasville. The syphilitic cases, requiring as they do large doses of alteratives, do especially well in Florida, in the Hot Springs of Arkansas or Dakota, not only because of the favorable climatic conditions in these several localities, but because of the greater tolerance that the system seems to possess for the iodides. The anæmic forms do best in mountain climates with a moderate degree of moisture and sometimes dryness, and the mountains of North Carolina are especially serviceable in this form of neuralgia. Neuralgia that is the product of neurasthenia is to be governed by the same general principles as have already been indicated as characterizing neurasthenia generally. A malarial neuralgic patient should be removed, of course, from a malarial district, and in removing these cases from a malarial to a non-malarial district the very important fact should always be borne in mind that the effects of the malarial poisoning are often, at least for the time being, very much intensified by this transfer, and a case running a comparatively mild course in a malarial district is often intensified into the most severe form by the transfer to an absolutely non-malarial country, so that the patient should be especially and strongly guarded against this danger by the free administration of quinine both at the time of the transfer and immediately after.

CHOREA. Chorea demands a low level or a marine climate.

These cases, as a rule, do very badly in the high and dry levels of the Rocky Mountains. The best possible results are to be had in marine climates, and Southern Florida, Thomasville, Ga., Atlantic City, and Lakewood, N. J., San Diego, California, are ideal localities for these cases. Epilepsy has much the same climatic relations as chorea, and, like chorea, should rarely, if ever, be treated if possible at a level above four thousand feet.

The chronic degenerative and progressive diseases of the nevous system need a dry, warm, and, as far as possible, an equable climate with abundance of sunshine, and below four thousand feet. But occasionally, in younger persons without atheroma or any cardiac complications, a high level climate is not contraindicated, and may be tried with the hope of benefit in those cases that fail to receive improvement from a climate that is theoretically the best suited to their conditions. Such climates as seem best indicateed are to be had in southwestern Texas, western Kansas, southern California, Egypt, northern Africa, and southern Spain.

SOME PERSONAL OBSERVATIONS UPON THE EFFECTS OF CHANGES OF CLIMATE UPON MEN AND ANIMALS.

By RICHARD COLE NEWTON, M.D.,
MONTCLAIR, N. J.

"Ability to meet the environment" has been defined as "the condition of leadership."[1] It is, without doubt, also the condition of health. When we speak of climate and change of climate it is doubtful whether we appreciate how comprehensive these terms really are. Climate, from a therapeutic standpoint at least, should be defined to mean a man's environment, the resultant of the combination of a number of forces, some of which can be weighed and estimated, and some of which have up to the present time eluded, and perhaps always will elude, the most painstaking investigations.

The complexity of the problems presented by the study of climatology has doubtless discouraged many from undertaking it, and has rendered the labors of others more or less futile. But the time has now come when these questions must be studied, and, if possible, settled; and this Society would be recreant to its trust and unworthy of its lamented founder[2] did it not keep in touch with the noble body of scientific workers who are attacking the problems of pathology, one after another, and are even now in many quarters dispelling the clouds of ignorance and superstition which have so long obscured the fundamental truths upon which the laws of health and disease are based. The great need, which I think

[1] By President Eliot, of Harvard University.

[2] The late Dr. Loomis.

we all appreciate, in the study of climatology at the present moment appears to be more investigation of individual cases, more ascertained and established facts in relation to the action of climatic changes upon people or animals. It therefore seems proper to urge every observer to make his experience known, no matter how limited it may be, and so add to the storehouse of the facts of climatology (at present only too meagrely supplied), and, according to his ability, provide the means of the deductive study of this intricate science.

The foregoing thoughts have led me to record my personal experience in the climate of the southwestern section of the United States while serving as an assistant surgeon in the army, in the hope that some, at least, of my observations may help along the great study which this Society has undertaken to advance.

When I reported for duty at Fort Stanton, New Mexico, in November, 1879, I found myself in a beautiful spot nearly surrounded by mountains. The post is 6150 feet above sea-level, the climate mild and delightful, but, to me at least, somewhat enervating. It took me three or four months to get quite used to the altitude.

I remember that on two or three occasions I spat a little blood, and that for a time I had to be content with very little physical exercise on account of muscular weakness and shortness of breath. I remember how startled I was, upon attempting to chop some wood (an exercise to which I had been somewhat addicted) when seized by a painful contraction of the recti abdominales muscles. However, these are only common experiences of people who have ascended into high altitudes.

As I looked about the post I was struck by the number of carcasses of cattle which were lying about, drying up in the fine, bright sunlight. I was told that these animals had perished from Texas fever or had been recently driven up from Texas and had died from the cold. I was told that the cattle who give the fever are themselves free from it. This remarkable statement was then generally accepted; but, as I suppose

you are aware, it has been disproved by the researches of Smith and Kilbourne[1] and others The cattle which bring the fever from the Gulf-coast counties of Texas, where it is endemic, are themselves sick with a chronic or subacute form of the disease, which, by reason of their acclimatization, does not seem to inconvenience them very much, nor does a change of climate apparently bring on a marked exacerbation of the fever. But their blood contains the micro-parasite of the disease, as proved by Smith and Kilbourne. Years ago Professor Law, I believe it was, pointed out that the southern Texas cattle have universally an enlargement of the spleen and a low grade of fever, and, while on their natural ranges, never get fat. Hence, for commercial reasons, they have to be driven away from the infected districts into northern pastures, where, after a time (so far as I know) not yet determined, their blood finally purges itself of the fever parasite and their condition markedly improves. Like the poor and miserable of the human family, these beasts are prolific breeders; and, as there are no severe frosts in southern Texas to kill the calves, and as the grass flourishes all the year round, this part of the United State furnishes an especially favorable breeding ground for neat cattle.

As already stated, the specific cause of the Texas cattle fever is a micro-organism which invades the blood-disks in apparently the same manner in which the *Plasmodium malariæ* invades the human blood-corpuscles. The infection, we are told, is carried from the Southern cattle (whose blood already contains the micro-organism) to the Northern cattle by the cattle-tick. This is a parasite which abounds freely in the South, and which attaches itself to the cattle and sucks their blood. It is dropped off along the ranges which they traverse, and, attaching itself to any other cattle that may cross the same range, introduces the specific micro-organism into their blood. There the germ multiplies and produces the well-known symptoms of Texas fever in its new host.

[1] Bulletin No. I., 1893, U. S. Dept. of Agriculture, Bureau of Animal Industry.

This whole process reminds one strongly of Dr. Patrick Manson's theory with respect to the transmission of the malarial parasite by means of the intervention of the mosquito. In short, the whole history of Texas cattle fever reminds one strongly of malarial fever in man, and it is fair to presume that further elucidation of the biology of the specific parasite of the former disease will throw a strong side light upon some of the unexplained points in the life-history of the specific germ of the latter.

The peculiarly forlorn appearance of the cattle just driven up from the Gulf-coast counties of Texas is quite striking, and the name applied to them—*i. e.*, "dogies"—is a frequent term of contempt and ridicule bestowed upon people and things generally in Texas. These "dogies" will weigh, perhaps, six or eight hundred pounds. They have long, shaggy, rough coats, long heads with enormous horns, long tails, and small, ill-developed bodies. They are thin and badly nourished to a degree, and a large percentage of them will die at the first hard frost. Of a number of them driven into the Panhandle of Texas or New Mexico, perhaps half or two-thirds will live through the first winter. In the spring another trial awaits them, namely, the heel fly, a pestiferous insect which bites the poor beasts just above their hoofs and drives them at full speed into the nearest water. It is a curious and rather comical sight to see some staid, old cow or solemn, lanky steer which had been quietly browsing suddenly snort, lift up its tail, and start on a wild run for the nearest pool or stream. Once in the cold water it is free from its tormentor, but frequently the shock of the cold is so great that the animal cannot get out of the water, but falls down, and unless rescued soon dies, and many of those which are drawn out, after having been in the water for some time, succumb from the shock to their weakened systems. Fortunately, the onslaughts of the heel fly last only a few days. It is during the first warm days of early spring, before the ice is all gone from the streams and ponds, that this peculiar insect abounds.

If the cattle survive until the grass is fairly started, they soon begin to improve wonderfully, and by fall no one would recognize in the smooth, round, and well-grown cattle the wretched "dogies" of the previous season. Their increase of weight amounts to several hundred pounds the first year. But they were generally kept on the northern ranges two or three years before being driven to market, by which time they would about double in weight. If, however, they were driven to Oregon and other places considerably further north, they would in two or three years triple or even quadruple their weight; certainly a remarkable effect of a change of climate. It was commonly believed in the Texas Panhandle that, after a winter there, the southern cattle were again susceptible to Texas fever, and this had always been my own opinion. I see, however, that Drs. Smith and Kilbourne seriously question the truth of this opinion, and believe that the cattle, having once recovered from the fever, are probably subsequently immune. This very interesting point requires further study.

After a sharp frost there will be no further fever in northern Texas or New Mexico until another drove of southern cattle comes and brings the germs, and cattle suffering from the fever, if subjected to frost (if they are not killed by it), will soon recover from the fever. It is highly probable that the constant presence of Texas fever on the southern cattle ranges is the explanation of the poor condition of the cattle, but it is not likely that in that elevated temperature the cattle ever would get very fat if there were no fever there. It seems to require plenty of cold weather, as well as good food, to make fat cattle.

In respect to horses brought into New Mexico for the use of the troops, I noticed that they were nearly all afflicted at first with what seemed to be a sharp attack of ordinary distemper. These horses were largely bought for the government in Illinois, Iowa, and other middle Western States, and were transported by railroad to the point nearest to the post and then driven the rest of the way. (It so happened that

nearly all of my stations were a considerable distance from the railroads). The journey into the post had to be made with the utmost care. A little over-exertion would kill the more severely affected of the horses. I remember that the animals were feverish and could not eat. Their coats were rough and lustreless, and some of them had swelling of the maxillary glands. In some cases these glands suppurated and had to be lanced, or even broke spontaneously. There seemed to be the same differences in the way this fever of acclimatization affected the horses that we noticed among the recruits. Some were very sick and a few died, while the majority were only slightly ill, and some of them showed no severity of symptoms at all—an interesting point, which indicates that animals also have the same varying susceptibility to climatic diseases that man has. After two or three months the horses seemed to be completely acclimatized, but it was a long time before they could endure as much hardship as the native animals, if, indeed, they ever did become so tough. I remember another curious thing about horses on those Western ranges. After a long, cold winter, when they had had little to eat, they became completely covered with lice. A more disgusting and pitiable sight it is hard to imagine.

The acclimatization of Western horses brought to the Atlantic seaboard takes at least twelve months and often twice as long. This seems in many cases to be due to bronchial troubles, which the animals contract in our damp climate, and which are difficult to get rid of. I have a horse now that for two winters after I bought him coughed and discharged mucus freely from his nostrils, so much so that I supposed he had consumption. He has recovered completely, and I think that he is not only a better horse than when I got him, but a better horse than he ever would have become had he remained in Michigan, where he was foaled. I have no doubt that it is harder to acclimatize horses from the middle West upon the Atlantic seaboard than in the Rocky Mountains, on account of the greater severity and changeableness of the climate.

The only other animals which I had opportunities of observing after a change of climate were a few dogs, and they seemed to endure the changes well, thus sustaining their reputation of being able to live in a greater diversity of climates than any other animal except man. As to the effect upon the health of men and women generally of a change from the Atlantic States to New Mexico or northern Texas, as a rule the effect was beneficial. Most of the men who came under my observation and who had changed their residence from the seaboard were recruits, and were young selected lives and better adapted to undergo vicissitudes of all sorts than people sent West for their health, and in that respect my observations would differ from those of observers who practise in the far West and see, for the most part, invalids who have been referred to them by Eastern practitioners.

During my eight years' service in New Mexico, Texas, and the Indian Territory I saw almost no nephritis and very little rheumatism; and, as regards the welfare of sufferers from the latter complaint, I am disposed to disagree with Dr. Solly,[1] who esteems altitude inimical to them. I did see some severe attacks of acute articular rheumatism, which originated in the places mentioned, but they were not frequent. They seemed often to be, at least in part, due to the excessive use of alcohol, and were quite amenable to treatment if abstinence from liquor could be enforced. It was a common saying out there that cases of rheumatism contracted in that climate would get well if sent East, and that cases contracted in the East would get well in their climate. The first proposition seems to have been borne out in a few cases which came to my knowledge. I do not remember to have met with any instances bearing upon the second.

It was also a common saying among the army officers that children brought from the East to the Rocky Mountains would do well, but that those taken from the mountains to the seaboard would do badly. Both of these statements I

[1] Hare's System of Therapeutics, vol. i., article on Climatology.

think are true. I do not believe in extreme changes of climate for infants and young children, but I feel satisfied that a change from a higher altitude to a lower is far more dangerous for these little people than the opposite change. Leaving out some cases of malarial fever, I can scarcely re call a death of an infant in my practice during my Western service, whereas I can recollect a number of small children of army officers who died after having been brought East. One of these was my own child, aged four years at the time of his death. His brother, aged six months, was apparently well when the elder boy died, but soon began to develop symptoms of disturbed nutrition. He was in a precarious condition for months. He had rickets, and did not walk until nearly three years old. He is now nervous, has flat feet, and is less robust than his younger brother, born in New Jersey. But I am glad to say that the fine climate of his present home agrees with him, and, as he gradually improves, we hope that he will grow up a stalwart man. It is only fair to state that both these children had been exposed to malaria. Malaria is the stealthy enemy of the weak and unacclimated, and seems to attack with especial violence any one who has recently undergone the shock to the nervous system which change of climate undoubtedly produces.

At Fort Stanton I saw a few cases of aneurism, more than I have seen in the fifteen years since I left there. A few of them died from rupture of the sac.

At this same post I saw a few cases of so-called mountain-fever. They all had petechiæ. One of them died of intestinal perforation, and an autopsy showed that the condition was typhoid. These cases were all, I believe, contracted in Fort Cummings, N. M., where the typhoid infection was in the drinking-water. The only remarkable thing about them was their excessively short duration and mild and uneventful course. The fatal case had not been confined to his bed. His temperature had not, so far as known, exceeded 100° F. His diet had not been restricted, and he had been dosed freely with quinine, upon the supposition that his fever was mala-

rial. The intestinal rupture seemed to have been brought on by a walk of about a mile in length, which he had asked permission to take.

I never saw, in my whole army experience, a case of heat-stroke nor one of subacute thermic fever, nor any other cases of mountain-fever than those just mentioned.

At Fort Elliott, Texas, which is about 3500 feet above sea-level, I had considerable civic practice and quite an opportunity to observe the women of the country. There are always in and about army posts a considerable number of women and children. I mention these facts to give proper weight to what I am about to say. Among newcomers in these regions disorders of menstruation were exceedingly common, but were not, in my experience, more frequent nor more severe or protracted than are the same disorders among the German, Swedish, and especially the Irish immigrants whom I now see in my practice; nor do I think that nervous or mental troubles were more severe or intractable than they are on the seaboard, and this in spite of the poor and restricted regimen and dearth of amusements and of intellectual pursuits. One great privation which we experienced in practising medicine in Texas and New Mexico was the want of milk and fresh butter. This want is no doubt now better supplied than it was ten or fifteen years ago, when the cattle were mainly wild range cattle, and no one thought it worth while to "gentle" the cows and milk them.

From a surgical aspect, the virtues of the aseptic climate of the Rocky Mountains and their foot-hills are too well-known to require any detailed testimony from me. Wounds always did well. I saw the knee-joint opened and a floating cartilage fished out without aseptic precautions or antiseptic treatment, and the man was entirely well in two or three days. I reported a gunshot-wound of the liver, followed by complete recovery, in July, 1881. I saw several cases in which bullets went completely through the lungs, with recovery. I reported two cases of double, compound, comminuted fracture (gunshot) of the extremities in the *Medical Record* of July 16, 1887, one of both arms, and the other of both legs, with recovery.

I quote from the closing paragraphs of that report: "It would not be just to omit mention of the action of wounds in the climate of New Mexico, which is so dry, so equable, so mild, and delightful. . . . . The efficaciousness of the climate in lung complaints is well known, and its salubrity, shown in the healing of wounds, is, I believe, as great, although, perhaps, not so familiar to the profession." It was then pointed out that in treating the wounds described no proper antisepsis was carried out, and yet they healed kindly, although they had certainly been exposed to infection for hours before they were dressed at all. The report then proceeds: "The beneficial action of the climate of New Mexico upon consumption and wounds alike might be construed as supporting the theory of the local origin of phthisis. At all events, wounded surfaces and diseased lungs enjoy a remarkable opportunity to recover in the localities mentioned." This was written before the writer knew anything of the tubercle bacillus and when he knew very little about the means of the infection of wounds.

Of diseases among the Indians I saw but little. They seemed, in the Indian Territory, quite susceptible to malaria and had learned to beg for quinine, which they took greedily. Those who could talk a little English would hold out their hands and ask for "white powder." If a small amount was poured into the palm, the applicant would say "heap, heap!"

While campaigning or "scouting," as it is generally called, with Indian scouts I have heard them coughing all night long, and was told by the officer in command that they were very subject to colds, especially after they had taken a sweat bath. Once in a while, probably every two or three months, the New Mexican Indian builds a little oven or tent of withes and covers it with skins until it is nearly air-tight. He then heats a number of stones and lays them upon the floor of the little oven and covers them with a blanket. He will then crawl in himself and lie there and sweat for two or three hours, after which he will run and plunge naked into an ice-cold stream. This procedure often results in severe colds.

Whether it had always been followed by colds, or whether the red man is deteriorating physically and takes cold more easily than he formerly did, I am not aware. But the impression among white men who were familiar with their ways of life was that they could not endure as much as they once could.

I saw one young Indian, to all appearance dying of consumption, at Anadarko, I. T., and was told that he had returned not very long before from the Carlisle School. It would appear that phthisis is not an infrequent result of the higher education among the red men as well as among the pale faces. I do not remember having seen a case of phthisis among the whites in the Indian Territory. That it may exist among the Indians and not among the whites of the same locality, Surgeons Chase and Barker[1] assert in describing the climate of Washington Territory. They say: "Not a case of phthisis originated in the place, but two or three cases which were imported improved rapidly under treatment. Phthisis, however, is very prevalent and very fatal among the Indians."

We perhaps too often lose sight of the fact that phthisis is especially the disease that cuts off those who have given up a roving or out-door life for a stationary or confined existence. It is the disease which destroys those who have exchanged a favorable for a less favorable environment or occupation. The mere moving about, even to less salubrious climates, appears to prevent the oncome of this malady. It has been pointed out[2] that the animals in a travelling menagerie are much healthier than those of the zoological gardens, although in the latter place they have every care and attention that science can suggest. The same writer speaks of the remarkable healthiness of gypsy children. He thinks that man was so long a wanderer on the face of the earth, constantly shifting his quarters to hunt for food, escape from or pursue his

[1] Bell's Climatology and Mineral Springs of the United States, p. 234.
[2] Dr. Louis Robinson, National Review, quoted by Dr. St. Clair Thomson, Therapeutic Gazette, 1896, p. 570.

enemies, and so on, that we are stamped with a nomadic tendency, and that it shows itself at times in a craving for a change of air. That this theory may be a correct explanation of the undoubted benefit which change merely as change frequently confers upon the health, I think is rendered probable by the physical history of the Indians. I do not believe that a case of phthisis was ever known among them until they were confined more or less permanently to one spot and prevented from going upon their hunting and warlike excursions. Now, like the caged animals in the museums, they are beginning to die of tuberculosis.

This is not because the modern Indian has given up living in tents, and is thus deprived of the accustomed amount of fresh air. His unerring instinct warns him not to live in the houses which mistaken philanthropy or enterprising government contractors have in some instances built for him. He may consent to keep his ponies in the houses, especially in stormy weather, but he will not live in them himself.

These thoughts lead to the suggestion that we are often too ambitious in ordering our patients change of air. They do not need to go a thousand or two miles to obtain fresh air and that change in their way of living which their health demands. They need more hygiene, more exercise, more sunlight, and probably a better diet. The immunity of sailors from phthisis is too well known to require comment. In these days of rational therapeutics, now that we cure typhoid fever and heart-disease by bathing and exercise, myxœdema by a special food, idiocy by graduated educational exercises, scurvy and rickets by a change of diet, and so on, why should we not inaugurate a system of treating phthsis by establishing roaming bands of consumptives, who shall live in the open air, and wander from place to place, not living in institutions or sanitaria, but in wild, free nature? Dr. Henry I. Bowditch's father seemed to have cured himself of phthisis by a carriage journey from Boston to Albany,[1] and in making his children take a daily walk of

[1] Trans. Amer. Climatological Association, 1889.

two or three miles is an example to us all. I still revere the memory of my own father, who caused me to walk to school and back every day. The distance was two and a half miles. Regular, systematic, not too severe exercise in the open air *every* day is what is needed to establish and develop such a constitution in the growing child that he will not be liable to phthisis.

However, this paper is already too long. I would sum up my observations as follows:

1. That the change of climate from the Rocky Mountains to the seaboard is more severe and dangerous than the reverse, especially to young children and horses.

2. That a medium or even high altitude is rather beneficial than otherwise to nervous diseases and the diseases of women, as well as to phthisis, and is not unfavorable to rheumatism.

3. That in the climate of northern Texas and New Mexico nephritis in all forms is exceedingly rare, while aneurism is somewhat common in the latter territory.

4. Wounds do remarkably well in all parts of the southwest in which I served, even in Fort Sill, which is unhealthy by reason of malaria.

5. That the ideally wholesome and satisfactory life is a nomadic one.

6. Let us remember that *cœlum*[1] *non animum mutant qui trans mare currunt.* Change of climate does not bring change of disposition, nor, for that matter, of predisposition. Precious and even invaluable as change of climate often is in a number of diseased conditions, it is not always what is most needed.

Let us more often be content with smaller doses of climate and supplement them with larger doses of hygiene, both moral and physical.

[1] The proper translation of *cœlum* in this line is "climate." See note to Lincoln's "Horace," line 27, Epistle xi., Epistles of Horace, Book I.

DISCUSSION.

Dr. Daland.—I was very much interested in Dr. Newton's paper, especially in that part relating to the diseases among Texas cattle. The fact that the blood shows the characteristic features of the plasmodium of malaria makes this disease very similar to malaria in man. In regard to the theory that the mosquito is the means of spreading that disease, I think it can be so considered in only a few cases and localities; in fact, it is a very unusual means of propagating malaria.

A BRIEF CONSIDERATION OF SOME POINTS IN THE MANAGEMENT OF CONSUMPTION, FOR THE PURPOSE OF DRAWING FORTH DISCUSSION BY THE MEMBERS OF THIS ASSOCIATION.

By ROBERT H. BABCOCK, A.M., M.D.
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The very title of this paper presupposes the postulate that we do not yet possess a specific treatment for pulmonary tuberculosis, but that each case must be managed clinically and symptomatically. It is in this belief that I venture to submit a few points for discussion, with the faith that the experience of our members will furnish valuable suggestions. The first symptom to which attention is called, therefore, is fever. This is so constant a phenomenon of the disease that consumption may almost be said to never exist without a febrile temperature. Moreover, next to the cough and expectoration, this symptom makes the greatest impression upon the patient and his friends, while it also contributes largely to the production of the wasting so characteristic of pulmonary tuberculosis. Is the slight elevation of temperature in early and unmixed forms of the disease inflammatory, as held by Jaccoud, or is it not rather an expression of infection by the tubercle bacillus? There can be no question, I think, as to the cause of pyrexia after the pus germs have set up a mixed infection; it is then a veritable septicæmia, and is what Jaccoud terms "the fever of absorption."

It is often important in the diagnosis of incipient cases to determine whether fever be present or absent. Therefore, I

should like to ask what temperature the members are accustomed to regard as febrile? I have often been told by the attending physician that his patient had fever, and upon inquiring "how much," have learned that it ranged from 99° to 99.5° F. Now I do not consider this pyrexia, for it falls within the limits of the daily fluctuations of normal temperature, and is so regarded by Finlayson. For diagnostic purposes I attach no importance to afternoon temperatures below 100° F., which, according to Finlayson, should be regarded as subfebrile, fever, according to this author, not being present until the temperature reaches 101.3° F.

In Landois and Stirling it is stated that fever affects digestion unfavorably by causing the gastric juice secreted during fever to be deficient in quantity and quality and of less than normal acidity, but they do not state specifically the lowest temperature that can be regarded as febrile except in so far as they quote the tables given by Finlayson. Hildebrandt and Riegal are said to have demonstrated that free hydrochloric acid disappears from the gastric juice after the body temperature has reached 38.5° C.—*i. e.*, 101.3° F. This agrees with the highest limit to subfebrile temperature given by Finlayson, and must therefore be accepted, I think, as the minimum degree below which patients cannot be said to have pyrexia. Consequently the question may be asked, Does temperature below this point—101.3° F.—call for therapeutic measures? This now brings us to the consideration of what is the best treatment of the pyrexia of consumption.

Now I frankly confess that for temperature below this point, and even when fever is moderate—*i. e.*, between this point and 103° F.—I am generally content to order absolute rest in the open air when possible, to regulate the diet and promote free expectoration. Solid food is allowed only at such times in the day as the temperature is subfebrile or normal, generally in the morning, of course; liquid diet, such as milk properly diluted with some alkaline water, is allowed when the fever is on. Patients are instructed how to cough intelligently and efficiently, and if the sputum be tenacious, terpin

hydrat or some other equally efficient and harmless expectorant is administered in the belief that at this stage febrile temperature is due largely to absorption and consequent sepsis. Dilute hydrochloric acid, pepsin, pancreatin, taka-diastase, and the like, are administered to aid the enfeebled digestion. If such simple measures do not suffice, careful sponging is resorted to whenever well borne. Detweiler gives, an hour before dinner and supper and at bedtime, small doses of antifebrin, 0.05 to 0.25 gramme, not so much for the purpose of permanently reducing the fever as to reduce it at meal-time, and thereby favor the secretion of hydrochloric acid. I have not tried this plan because I have always been reluctant to order the coal-tar antipyretics on account of the depression sometimes occasioned and the likelihood of increasing the already too profuse perspiration. Likewise I have had no experience with the local use of guaiacol. In fact, it is my rule in the management of chronic pulmonary tuberculosis, to which class of cases these remarks are confined, to administer as little medicine as possible, apart from strychnine and the carbonates of guaiacol and creosote, relying chiefly on fresh air, rest, and nourishment. Whenever drugs are ordered they are usually in response to troublesome symptoms, as cough and sweating, anorexia, diarrhœa, and the like.

The second symptom whose treatment I desire discussed is the night-sweats. They are a phenomenon of sepsis, and the ideal treatment would be the removal of the cause. Inasmuch as this is impossible, and sweating may frequently be so profuse as to exhaust the patient, we are often compelled to resort to antisudorals. Of these I generally employ, first, picrotoxin, $\frac{1}{60}$ of a grain in the late afternoon, and a like dose in the evening, so as to get the action of the remedy before the expected sweat. I have rarely known this to fail, and have never seen any unpleasant effects. I never use atropine for this purpose, but do sometimes order camphoric acid in 15 grain doses t. i. d.

Diarrhœa is another symptom which in advanced cases is

often very obstinate and requires skilful handling. This is generally put down to intestinal ulceration, and doubtless correctly, but it seems to me that I have observed too great readiness on the part of practitioners to make this diagnosis not only in early cases, but also in late ones. Fermentative indigestion is so common among consumptives and may cause such marked hyperæsthesia and tenderness of the abdomen, with colicky pains and intolerance by the colon of its contents, as to strongly suggest intestinal tuberculosis. For my part, therefore, when at all in doubt, I give the patient the benefit of the doubt by attributing his diarrhœa to the less serious condition, and treat accordingly. I hope the members will inform us of their treatment of this symptom. I rarely prescribe opium, preferring intestinal antiseptics, as dermatol and other bismuth preparations, benzonaphthol and salophen; but when I do resort to an anodyne I give phosphate of codein. A tubercular physician, now in Texas, told me that after having had obstinate diarrhœa for months, while in Mexico, he obtained prompt and lasting relief from enteric pills of creosote. As this treatment was coincident with his removal to a somewhat lower altitude in Arizona, the query arises, How much is to be attributed to the creosote and how much to the change of location?

It has always been my belief that laryngeal tuberculosis contraindicated residence in a high climate, as Colorado and New Mexico. Yet, as I have known instances of patients being retained in these climates by their Colorado or New Mexico physicians after the larynx had become diseased, instead of being transferred to a lower altitude, I should like to learn the opinion of our members on this point. Should we send our patients to Colorado and New Mexico if the larynx is infiltrated, but not yet ulcerated?

Finally, what opinion should one give to a patient who has regained his health at a high altitude and then desires to return for permanent residence to his old home at the sea level? I have always regarded it as unwise, if not actually unsafe, even in cases of incipient and circumscribed lesions. Aside

from the fact that the climate of the patient's former home is less dry, equable, sunshiny and pure, it has seemed to me a dangerous experiment because the apices and borders of the lungs expanded under low atmospheric pressure are again likely to fall into comparative disuse at a low altitude. Will respiratory gymnastics prevent this? Is it safe for a patient having nearly or quite regained health in Colorado or New Mexico to remove permanently to even desirable localities in Southern California, Texas or other comparatively salubrious climates of lower altitude? Is it necessary to impress patients who have not pronounced tubercular inheritance with the importance of changing residence permanently? This is my wont, and yet I know of patients who, having recovered in Colorado, are now living in Chicago without, as yet, a return of symptoms. With such questions constantly arising for decision, I am often oppressed by the responsibility resting upon me, and therefore desire the opinion of our members on this point.

DISCUSSION.

Dr. V. Y. Bowditch: In regard to what Dr. Babcock said, that it is not necessary to force down the temperature of phthisical patients who do not complain of fever, I can heartily agree with him. How often we see a patient who complains of no fever, and yet we find a temperature of 100° or more. Attend to the general condition of the patient, and leave the fever alone unless it causes great discomfort. As to the return to a lower altitude after a residence in a higher one, where health has been regained, my early teachings and my own experience have made me feel it is an experiment attended with much risk. We know of many exceptions, doubtless, but my usual advice to a patient is to remain in or near the place in which he regained his health; speaking more, of course, of consumptives.

In Dr. Fisk's remarks he tells us that he considers the chief sources of benefit to be good food, fresh air, and judicious exercise. In this I heartily agree with him.

Dr. Hance: As to the question of sending laryngeal patients away, I think that it depends upon the degree of laryngeal invasion. If they are in the last stage of phthisis, they might as well stay at home.

I have found that Tully tablets, in combination with bismuth or salol, are very good to use for the diarrhœa in such cases. Instead of using morphine in the last stages of phthisis, codeine will often carry the patient on for two or three weeks, or even months, after which we must fall back on morphine. There is one preparation of service in the early stages of the disease. Dr. Quimby spoke of it in the first year of my membership in this Association. It is aquzone, which improves the condition of the stomach. In the last report of the Sanitarium at Saranac Lake it speaks of the use of tuberculin. There were many patients there who were using it. During the time it has been in use at the Sanitarium there have been twenty-four patients discharged "apparently cured." Their after-history has been followed, and it is reported that twenty-two are now well, and that one died of chronic alcoholism and one in an insane asylum. They have now all been away from the Sanitarium from one to five years, and the majority over two years.

Dr. Newton: I should like to know why Dr. Babcock objects to the use of atropine to check night-sweats of phthisis. I have generally had good results from its use. I am now treating an advanced case of phthisis in which atropine in reasonable doses having, apparently, lost its antiseptic power, I resorted to the use of agaricin, and, afterward, of camphoric acid. Neither of these drugs proving to be satisfactory, I tried sulphonal in seven and one-half grain doses every six or eight hours, and was much pleased with the result.

Dr. Hare: The results of the experiments of those who have done laboratory work prove that guinea-pigs confined in laboratories are naturally subject to tuberculosis.

The great objection to the use of atropine for the treatment of night-sweats is the fact that it disorders the digestion by stopping the secretion of gastric juice. I have for a number of years used camphoric acid with very great satisfaction. It should be given in the dose of at least twenty grains three or four hours before the usual time of the sweat, so that it may be absorbed from the stomach in time to exert its physiological action. It dissolves very slowly, and is best given in a cachet or konseal. I have recently been engaged in studying the rapidity of absorption of various drugs, and I believe that the condition of the gastro-intestinal mucous membrane in relation to the absorption of remedies is not sufficiently studied. Briefly, I may state that if a small quantity of some gastric stimulant, such as capsicum, is added to the camphoric acid in the capsule it will aid very materially in the absorption of this antisudorific remedy.

Dr. Hance: My experience has not been such as Dr. Hare describes. I have used at least two hundred guinea-pigs in experimental work; by far the largest proportion of these were found free from any tubercular infection after they had been subjected to inocu-

lation, and only those were tubercular in which we had reason to suspect the presence of the tubercle bacilli previous to inoculation. If guinea-pigs are found tubercular without any inoculation, they have either been inoculated by reason of bad breeding-quarters or lack of care in looking after them in the laboratories where the experiments are performed. Dr. Hare's references to investigations fifteen years ago are too old to bear much weight at the present time.

Dr. Solly: I was glad to hear what Dr. Hare and Dr. Hance have said, and I heartily agree with them. Some physicians think that because the patient worries about the night-sweats and feels that the doctor should be giving him something to stop them, they should fall in with the patient's mood. I would let the night-sweats take care of themselves and devote myself to building up the system. It is generally a question of food. The intelligent use of whiskey is all right, but the patient should not be allowed to drink all the whiskey he can, for this often leads to drunkenness.

Concerning tubercular laryngitis, I am convinced that the delusion ought to be put to one side that high altitudes are bad for this. If altitude is good for their tuberculosis, it will be good for the other complaint also, but not otherwise. Another point is that tubercular laryngitis in the ulcerative stage should be given local treatment. The physicians were said to lay great stress upon this at the health resorts formerly, but this is changed. All things being considered in the question about the possibilities of error, I cannot believe that these sources of error exist. The point here in Colorado seems to lie between the extreme fear of tubercular infection and the saying that there is nothing in the thing at all. Dr. Abernethy was called in to see a patient and was asked what disinfectants would be good for him. He replied that any disinfectant would be of the greatest benefit that would make him open the window.

Dr. W. H. Daly: In the belief that we would all like to hear of the experience of others upon this interesting subject, I would state that for three years I have been administering doses of one-half to one drop pure carbolic acid, with one to two drops of compound liquor of iodine in water, one-half hour before meals, followed by as much hot water as the patients can drink, with very beneficial effects; in fact, in some cases I have succeeded in placing the progress of the disease in arrest. I found some of the more fickle-minded patients objected to taking this solution. I therefore had some tablets made representing the same, or supposed to represent the same drugs and dose, but the same good results did not follow their use. I therefore prefer the solution. You will also find the same combination of much value in la grippe and grippal pneumonia. In fact, in the latter cases, it is of marvellous value; in the former class of cases I also keep the air of the bed-chamber saturated with iodoform, and find that patients

soon become accustomed to the odor, even when they are young girls that one would naturally expect to raise objections.

If I were to be denied all remedies but one for the abatement of cough, I should choose laudanum in the minimum adequate dose. Another valuable remedy for cough of phthisis is sulphate of codeine; far better than codeia is the sulphate of codeine in one-grain doses at bedtime; it will put the patient through the night without cough and disturb the secretion but slightly.

Dr. Knight: As I was not present yesterday when the paper was read, perhaps I ought not to say anything. Still, I would like to say a word. I think that it is important to treat laryngeal ulcerations that are easily accessible locally; the present modern method is by curetting and the application of lactic acid. This will often prove very satisfactory, and should be tried, especially when the ulceration seems superficial and there is no perichondritis. As to dusting the room with iodoform, I have not done that; but I use it internally, one to three grains of this taking the place of creosote. I have found that patients will tolerate from three to six grains of it a day. I would like to ask Dr. Daly what effect he wished to obtain from the use of iodoform, and whether he used it for its antiseptic effect.

Dr. Daly: I am very pleased to be asked this question, and I answer that in my opinion iodoform is the best and safest germicide that can be used in the air-passages. I am in the habit of cleansing, as far as I can, the gray mass from the ulcers of laryngeal phthisis and then covering the surface with iodoform powder, and I instruct the nurse or attendant to repeat this often, and always after free expectoration by the patient; I endeavor to bring the patient as completely and quickly as possible under the influence of iodoform, and maintain the influence; and if this can be done, and foolish objections of friends as to the odor overcome, an arrest of the disease and, in many instances, a cure may be expected. I have had some cases that lived six, eight, and ten years, apparently well, and died of other causes—one from a debauch, one from injuries in a railroad accident, and one from typhoid fever. I have also given iodoform internally, in from one to five grain doses, as an antiseptic and alterative in other diseases, especially those of the digestive organs, it being an educt of iodine, than which there can be no better antiseptic.

Dr. Babcock: Concerning the danger of allowing tuberculous patients to return to their old homes, I may say that this question has troubled me more than any other I know. There is a relative of mine now in Colorado who was sent thither on account of his lungs, and who now, having regained his health, proposes to return to his home on Long Island Sound for the summer. It seems to me this will be a disastrous move for him to make, because of the great dampness where he is to remain, on the Connecticut shore. I should like to

hear the opinion of some of the other members in this respect. Dr. Hare's reply stating the objections to atropine seems to me quite a sufficient one, but its unpleasant physiological effects are enough to influence us to try some other remedy. I was delighted to have Dr. Curtin indorse what I said about diarrhœa in phthisis as a symptom of fermentative indigestion rather than intestinal tuberculosis. I cannot pass by the remarks of Dr. Daly concerning the use of laudanum. Of course, we are sometimes compelled to use opium in cases of consumption, but I think its use should be put off as long as is possible, and that codeine preparations should be used instead, since they are devoid of the unpleasant effects of other opiates.

Dr. Fisk: I wish to say a word or two regarding the return of invalids to their homes from Colorado. I have seen some who might be allowed to do so with perfect safety. The relative of Dr. Babcock is now under my care, and I may say that it is with my advice and consent that he comes East.

THE CLINICAL VALUE OF THE CULTURE-PRODUCTS OF THE BACILLUS OF TUBERCULOSIS.

By KARL VON RUCK, B.S., M.D.,
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In considering this subject we may, perhaps, best do so by finding answers to the following questions:

1. Have substances obtained from the matured culture of the bacillus of tuberculosis an antagonistic influence upon its life and growth, and can they be distinguished, chemically or physiologically, from similar substances obtained from the culture fluid upon which no such growth has taken place?

2. If such substances have a therapeutic value, what may we expect to accomplish with them, and what would be their limitations?

3. What available data and experience justify us in the belief that our conclusions as to their therapeutic value are correct?

A study of the evidence which I have gathered in my clinical and laboratory experience, and of the evidence adduced by others in available literature extending over a period of over six years, confirms me in my belief that the first question must be answered in the affirmative.

The details of experiments with the artificial culture of the tubercle bacillus upon bouillon, and its subsequent behavior, seem to confirm my position in regard to the first question.

When a culture of the tubercle bacillus is made with either an alkaline, neutral, or slightly acid reaction of the nutrient fluid, various degrees of growth of the bacillus take place;

under ordinary circumstances the growth is most prolific upon the moderately alkaline fluid, but in subsequent generations the bacillus appears to accommodate and adapt itself to slight variation in the reaction of the media, so that we can obtain a good growth even if the culture-fluid is primarily of an acid reaction ; but in all such cultures a final limit is reached when no further growth takes place.

If we examine the reaction of the culture-fluid upon which the germ appears to have reached the limit of growth, we find either that the primary alkalinity has been diminished or that the primary neutral solution has become slightly acid, or, having started with an acid media, that it has become more acid still ; but we find further that the addition of alkali to the now neutral or acid media is frequently followed by a slight renewed growth, while the culture primarily alkaline and still alkaline when growth has ceased, does not show further growth and development of the germ if more alkali is added.

No matter how we may originally have started, the growth reaches a limit, and no addition of alkali gives any further aid.

If we, however, add new fluid to such full-grown alkaline cultures, renewed growth and development appear in proportion to the amount added.

This would go to show that the tubercle bacillus naturally grows best upon alkaline media, that an acid is formed during its growth, that the production of the acid checks the growth, but that it is otherwise limited also, since the addition of alkali to neutral or acid cultures is effective only for a time, and the growth finally ceases in media primarily, and continuously alkaline, the same as in media primarily neutral or acid, and subsequently kept continuously alkaline.

The explanation of this could be, that the nutrient material contained in the culture-fluid has become used up, and has been exhausted by the germs, or that something new and different has been formed by the germs, or that other changes have taken place in the fluid during the growth and multipli-

cation of the germs, which are inimical to their further life and multiplication.

If we examine a healthy and rapidly growing culture, we find the tubercle bacillus, as a rule, to be well formed and stained, and the condition which we speak of as "degeneration" is not well marked, certainly not predominant.

If, on the other hand, we examine the germs of the ripe, matured culture, we find the degeneration-forms not only to predominate, but note only occasionally well-formed bacilli —thus the rapidly growing cultures and the matured cultures differ, in that the former contains mostly perfect forms, while the latter contains mostly degeneration-forms.

If we transplant from a culture in which degeneration of the germs has obtained its highest degree, we find that for a long period of time the new culture shows but very slight growth, and in some instances in my experiments no growth was apparent after four months, while with transplantations from a rapidly growing culture, in which few degeneration-forms were present, the new cultures grew rapidly and vigorously, very often maturing in from six weeks to two months.

If we use the bacilli from such cultures for infection of the guinea-pig, the minimum for successful infection requires to be greater from the ripe than from the growing culture in proportion to the degree of degeneration of the germs, and we also find that animals infected with bacilli showing extreme degeneration live much longer, and the resulting disease is much slower in its development and course than is the case when bacilli are used coming from a culture in which degeneration was not marked.

In further examining this fluid upon which a culture has reached its full growth and limitation, we find plenty of the original nutrient material present, and that other germs grow upon it luxuriantly; but beyond this we cannot with certainty demonstrate the presence of any recognizable change (unless it is a decrease in alkalinity) or the formation of any new substance.

If we now take the bodies of tubercle bacilli and extract

them with glycerin, we obtain an extractive substance resembling in its physiological effects that of tuberculin, but if we first extract the bacilli with ether or benzol and remove their fat, then we can obtain a watery extract which I shall show further on has a favorable influence in the production of at least relative immunity without tuberculin reactions.

In examining these proteid substances, obtained from the fluid of the culture, or from extraction of the germs, chemistry gives us no definite answers; but we find that they differ in their effects, as compared with similar substances obtained from the unplanted culture-fluid, so that the previously relatively inert substances have assumed new properties during the growth of the culture.

The fluid of the ripe culture when concentrated so as to represent one-tenth of the original bulk is the original tuberculin of Koch after the bacilli are filtered out.

This, when injected in animals and man causes certain well-defined effects according to the dose given, most marked among which are acceleration of the heart-action and rise of temperature, and in man a sense of lassitude, often aching in the back and loins, headaches, and nausea.

For such an effect in a healthy man we require doses of from twenty to fifty milligrammes, the symptoms appear in the course of six to twenty-four hours, and last from a few hours to twenty-four hours.

Smaller doses show a correspondingly slighter effect, but ten milligrammes produce, as a rule, no effect at all in a healthy full-grown person.

If, however, the subject of the experiment is suffering from tuberculosis even minute doses (ten milligrammes or less), and in some instances in my experience as small a dose as $\frac{1}{10}$ of a miligramme, cause the above-stated symptoms to be more or less pronounced. The same is true in animals; doses which in the healthy animal cause no disturbance whatever are followed by increased temperature, if tuberculosis is present; and upon this peculiarity depends the diagnostic value of tuberculin.

If we ask for the reason of this peculiar behavior of the tubercular organism to an otherwise non-effective dose of tuberculin, we can only offer theoretical explanations; but all such, heretofore proposed by myself and others, are not entirely satisfactory.

The actual facts observed are, however, that the tubercular locality shows evidence of marked congestion, and in experimental work with animals we find this, together with capillary stasis and obstruction and minute capillary hemorrhages, in the tubercular organs.

If we inquire into the therapeutic uses of tuberculin, we learn that the doses can be so adjusted as to avoid the physiological effects mentioned, and that the remedy can then be increased very gradually until the patient or animal can tolerate comparatively large doses without symptoms or discomfort, producing thereby only local reactions.

Under such use many cures have been established in the human subject and more recently the Bureau of Animal Industry, of Washington, has also accomplished a cure in bovine tuberculosis by the use of tuberculin.

In the smaller experiment animals, especially in the guinea-pig, an absolute cure must ever be difficult or impossible; they suffer from disseminated tuberculosis from the beginning, and if the tubercular process has been controlled so that little of tubercular tissue is formed or left, the animals die from secondary effects before a final disappearance of all tubercle can be accomplished.

Professor Koch has produced marked curative effects, and others have made similar claims. In our laboratory similar experiments have also shown a certain degree of influence, but in no case have we accomplished an absolute cure with tuberculin.

These observations confirm, however, that tuberculin does contain something which tends to a cure of tuberculosis, and those who have had the greatest experience in its use are very positive in asserting this fact.

Koch, Klebs, Hunter, Trudeau, and myself have en-

deavored to isolate the valuable and curative part of the culture of the tubercle bacilli with varying degrees of success.

The Klebs' modifications have given the best results, especially in so far that the one he calls antiphthisin does not produce fever even in large doses, whereas tuberculocidin and Hunter's and Trudeau's products seem to contain more or less fever-producing substances.

Under antiphthisin, with which I have had experience in the treatment of several hundred cases, some of which I have heretofore reported, the best clinical results have thus far been obtained; and while I have not been able to fully confirm the claims made by its author as to its value in the animal experiments, although most painstakingly repeated during the last year in my laboratory, and while the claims made by its author, "that antiphthisin kills tubercle bacilli *in vitro*," proved incorrect in an experiment started by himself in our laboratory shortly before he left, and of which I have noted the results, I have not the slightest doubt of its clinical value and its influence upon the purely tubercular process.

The failure to kill tubercle bacilli *in vitro* by their immersion in antiphthisin does by no means prove that under continued use of the remedy the germ is not adversely affected in our patients, neither must the action be direct, as it scarcely can be under the small doses which prove effective; on the contrary, it is much more probable that the action is only supplementary to the natural antitoxic and germicidal action of the living tissues, especially the blood.

As to the mode of action of these (as of many other remedies), we can at most offer more or less plausible theories; surely no one is in a position to offer conclusions. We are not prepared to do this even as to the action of mercury in syphilis after many years of its use. The small dose effective cannot be directly germicidal, and yet under its continued employment syphilitic lesions are influenced so that they disappear.

Under the clinical use of antiphthisin and tuberculinum

purificatum I and many other observers who expect to eventually report their work independently, or have already done so, have seen areas of dulness clear up and return to normal conditions, the abnormal respiratory sounds giving place to normal vesicular respiration with corresponding improvement in the general condition of patients and disappearance of symptoms—a result in tubercular disease of the lung entirely unique in all past experiences.

Without the use of this remedy, or of tuberculin which preceded it, I have never witnessed such local changes, and if the remedies under which only we observe this are not responsible for it, there would be no other explanation than that these observations are always coincidences, and that the physical phenomena which we observed to disappear were due to recent, acute, pneumonic processes, congestions, or œdema complicating the particular case. That this was not the explanation I am quite sure, because in many instanecs there had been at no time any acute inflammatory condition in the lung, and the cases presented the usual evidence of tubercular disease.

I must, however, here point out that these favorable and unique local changes do by no means always include the entire lung portions involved, and that localities where the physical signs justified the belief that the lesions were old and probably due to fibroid or caseous changes, with or without cavities, showed often but slight or no improvement.

My impression under most careful records at each examination has been that localities the seat of more recent extension of the disease cleared up, whereas the older lesions showed little or no influence.

In many early stage cases where the disease was not extensive the physical evidence disappeared entirely. In other cases, where both lungs were involved, the side showing the slighter abnormal percussion and auscultation phenomena cleared up entirely, the more involved side only partially, and this was the case with all patients which were treated with the remedy under the auspices of the New Orleans Com-

mission a year ago, and which justified those who examined the patients to say of them, as I say of my own cases, that they never before witnessed such results.

While I am, of course, unable to say what the total of my clinical results would have been had I not employed the remedies under consideration, the results have greatly improved under their use, and the last report made by me of the work done in the Winyah Sanitarium[1] shows nearly twice as large a percentage of cases apparently recovered or greatly improved as I was able to obtain prior to the time when I first began the use of crude tuberculin in selected cases.

I cannot appreciate that my clinical material has, on the whole, been more favorable, nor have I made other important changes in the treatment and care of my patients. I have then as now recognized the importance of dietetic and hygienic measures, and of climatic treatment, and have conscientiously insisted upon them at all times with every patient who has come under my care; and while I am well convinced that without such a course and the advantage of having my patients under more constant professional control, the results would have been materially changed, I am equally convinced that the addition of these remedies has been a great help.

[1] This report of 182 cases treated at the Winyah Sanitarium, at Asheville, N. C., is published in the Therapeutic Gazette, May, 1896, in full, showing the following

RECAPITULATION OF RESULTS.

Class.	No. of cases treated.	Apparently recovered.		Disease arrested; greatly improved.		Improved		Not improved.		Grown worse or died.		Corresponding to
		No.	P. c.	No.	P. c.	No	P. c.	No.	P. c.	No.	P. c.	
A	32	26	81	5	16	1	3	0	0	0	0	Early stage.
B	74	26	35.1	25	34	17	23	3	4	3	4	Middle stage.
C	76	7	9	26	34.2	11	14.4	3	4	29	38.4	Last stage.
Total (all cases)	182	59	32.4	56	30.8	29	16	6	3.3	32	17.5	All stages.

This clinical experience is further confirmed by bacteriological examinations of sputum from cases under treatment, in most of which a marked degeneration of tubercle bacilli was observed to occur in from four to six weeks' use of the remedy; in many the number of germs was materially diminished, while in some cases they, as well as the sputum, disappeared entirely.

In all cases sputum examinations were made before the treatment was begun, and the slides were preserved for comparison.

I am well aware that degeneration forms of tubercle bacilli are often found in tubercular sputum, and even in cases in which the disease pursues an unfavorable course; indeed, without the use of culture-products we find these forms most frequently in patients who are making rapid progress toward recovery, or who are nearing a fatal issue.

With the remedies under consideration I have noted the gradual increase of degeneration forms quite uniformly in *all* cases until in many slides not a single well-formed bacillus could be demonstrated, so that in some instances it was a question whether the distorted and nearly coccus-like form was a tubercle bacillus at all; while at the same time the number showed a steady decrease until in the most favorable cases none were found at all, an experience quite different from that in which a few of the bacilli show a similar condition.

This almost regular and uniform observation causes me to entertain the thought that the degeneration stands in relation to the remedy; occasional exceptions were, however, noted, but they could be accounted for in almost all cases.

A recent contradictory observation in a case may be of interest. The patient had progressed most favorably in all respects under the use of tuberculinum purificatum; the sputum, after having shown degeneration and decrease in the number of tubercle bacilli, had become very slight in quantity and contained no bacilli whatever when last examined. Thereafter the patient began to show some rises of tem-

perature, first slight, but gradually increasing ; lost her appetite, and decreased in weight; the cough also increased, but locally the most painstaking examination furnished no clue for several weeks as to the cause of this unfavorable change. There was, however, a small area below one clavicle, which had been undergoing no change whatever from the first examination to the last; the percussion-note there had always been flat and the respiration bronchial. In this area moist sounds began to appear, and, under an increase of the fever and the cough, the patient suddenly discharged several large mouthfuls of muco-purulent matter tinged with blood, when an amelioration of the symptoms took place. In this sputum we found well-formed and stained tubercle bacilli in great numbers, and the small dull area spoken of showed now every evidence of a cavity.

As to the explanation of this experience, there can be no doubt that the dull locality which had remained uninfluenced was the seat of a caseous mass more or less encapsulated; that this caseous mass softened and absorption from it gave rise to fever; that the increase in cough was due to local irritation, and that the free expectoration coincided with the discharge of the cavity into a bronchus.

That the discharged, liquefied caseous material contained tubercle bacilli would be most natural, for it is not to be thought of that the remedies employed could possibly have reached or influenced these germs in the encapsulated dead tissue entirely removed from the circulation.

In this matter of degeneration observed in sputum I would, however, not wish to be too positive, and invite other observers to study the subject. Its occurrence I am sure of; that is to say, we observe a difference in the appearance of the germs from a regular, well-defined bacillus; we note a granular type, shorter and club-shaped forms, until finally an extreme stage is reached which has nothing but a coccus-like appearance, perhaps slightly elongated, and more or less perfectly stained.

A further confirmation of the clinical value of these

culture-products we have in their effect upon lupus and other local tubercular processes which are accessible to direct inspection.

The numerous cases of lupus which were recorded by most competent observers as having been favorably influenced or cured with the injections of tuberculin give unmistakable testimony; the only difficulty was that, although lupus could be brought to heal and cicatrize under its use, the effect was rarely a permanent one; after varying periods of time new manifestations became apparent in and adjacent to the cicatricial tissue, and then the disease recurred.

Discouraging as this experience was, it nevertheless demonstrated the curative influence and the direct specific effect of the remedy; because we have no other substance which we can inject in the patient's back or arm remote from the local lesion and obtain the slightest influence upon lupus or any other tubercular process.

For these relapses in lupus, as for the incomplete or partial effect upon other tubercular processes of the culture-products, there are undoubtedly good and sufficient reasons, if we only understood them. One of the reasons is obvious, and might have been recognized *à priori* as an insuperable limitation—namely, the non-vascular condition of all tubercles, the aggregation of minute tubercles into larger ones, and these into small or large nodules; their caseous degeneration, and the consequent inaccessibility of such isolated or aggregated tubercles to the circulation; such tubercle could only be reached by penetration of the remedy, upon the principle of osmosis.

The larger the tubercle and the more advanced it is in degeneration the greater is the probability that the contained tubercle bacilli are effectually protected from the influence of remedies which are thus to reach it through the blood; and if in addition we remember the formation of new cicatricial tissue upon the periphery of tubercle, remember the frequent complete obstruction of blood and lymph channels in the vicinity of tubercle, and even at considerable distances from

it, we need not wonder that the results of treatment with these products have, as a rule, been only partial, and have not met the hopes of those who, in their enthusiasm over the primary evidence, forgot all their pathology and expected that nature had reversed her laws in the production of a veritable miracle, and that this perihelion of blind faith was of necessity followed by the aphelion of skepticism.

I have, however, no doubt that the observation of the toxic effects of crude tuberculin added also to the disappointment, and it was natural to reason that if the remedy could not, as a rule, produce a permanent cure, it was unjustifiable to incur the risks which appeared at times quite serious under the large and actually injurious doses of tuberculin and the forced increase of dosage by which it was hoped to compel better results.

In other local tuberculoses accessible to inspection we may also remember the good, and at times brilliant, results which were observed in the superficial tubercular affections of the larynx, and more recently the observations of favorable results in tubercular ulcers of the nose, the eyelids, the ear, and upon the integument by the use of purified tuberculin when only locally applied.

I, myself, saw the complete healing and cicatrization of a recent tubercular ulcer upon the lower lip in a patient far advanced in pulmonary tuberculosis, and in which no other treatment than the local and hypodermic use of purified tuberculin was made use of. All who have seen such ulcers in advanced and exhausted cases of consumption know very well that they never heal, but tend to undermine the integument and to enlarge indefinitely until the patient dies.

The clinical value of the culture-product, especially of the purified preparations, is further manifest in the control of the fever, which we observe in the early stages of pulmonary tuberculosis at a period when the elevation of temperature can be presumed to be due to the absorption of the toxic products of the germs only.

In the more fully established disease, where we have also

absorption of liquefied and decomposing organic substances from necrotic tissue, and from suppuration, the cause of the fever becomes very complex, and the influence of the purified culture-products in its removal is then, at best, only partial.

Unless in acute miliary tuberculosis, the purely tubercular fever is very moderate, rarely exceeding 100° F.; quite different from the hectic and septic fever in advanced cases, which would undoubtedly exist and continue even if all tubercle bacilli could be removed from the diseased organism.

While the tubercle bacillus is undoubtedly primarily responsible for the lesions which subsequently cause and maintain the fever, it must be readily understood that when the tissues have degenerated, softened, and liquefied; when they have become necrotic; when other germs have gained entrance and have caused suppuration, the substances which are now being absorbed have no direct connection with the tubercle-bacillus; that they are the products of decomposing organic matter, and produce the fever, emaciation, night-sweats and exhaustion, no matter whether the tubercle bacillus or some other agency has primarily been responsible.

This we should also have known *a priori*, and we should never have been disappointed when we realized the true relation by experience. Such fever we cannot hope to remove by the use of tuberculin, or by its purified modifications, and, in estimating their antagonistic properties to the bacillus of tuberculosis by their influence over the fever, we must not select such cases for the basis of our investigations, but rather choose very early stages of the disease, where no such secondary and tertiary causes are usually at work.

But even in these so-called early stages we are occasionally liable to overlook the presence of such secondary causes as, for instance, when the lung affection is secondary to a breaking down of a bronchial or mesenteric gland, and when it is possible that absorption from it continues to deliver pyogenic products into the circulation.

Careful study and observation enable us, however, as a rule, to distinguish between fever due to secondary causes

and effects and that due to the purely tubercular process, which latter alone can be expected to be influenced.

That it is favorably influenced I have every reason to believe, having almost uniformly witnessed the advent of a normal temperature in the course of the first month's use of the purified products in all such uncomplicated early stage cases.

In cases where the fever was probably due to the absorption of products due to the degeneration and disintegration of tissue these remedies have, as a rule, shown a mitigating influence; but other measures were necessary and were employed, under the combination of which I have been able to frequently conduct the case to an entire cessation of fever, as well as of other symptoms; while, unfortunately, in a number of far-advanced cases the disease did not appear to be influenced sufficiently so as to make any difference in the final outcome.

A case showing the influence of purified tuberculin upon the local lesions, the fever, and the general condition of the patient, quite recently observed, may be of interest, and it also shows the value of the remedy for clinical diagnosis, and may serve for an example of cases in which we can hope for more uniform favorable results.

Mrs. B. had been in good health until last August, and gives no tubercular family history; at the age of eighteen years she had a severe cough lasting four or five months, under which she had some fever, lost flesh, and grew weak; from this she recovered perfectly, and had no trouble with her lungs until last summer.

She came under my care last October, complaining of a slight, hacking cough, and a constant sense of exhaustion and fatigue. Her nutrition was still good, appetite fair, all functions except the heart-action appeared normal. The heart showed no organic disease, but the slightest exertion caused an increase of the pulse-rate of 40 to 60 beats to the minute; indeed, the pulse was several times found so rapid that it could not be counted after ascending a pair of easy stairs.

Examination of the chest showed slight relative dulness of right upper lobe, both anterior and posterior; neither was the left apex above the clavicle fully resonant.

On auscultation there was harsh respiration with prolonged expiration above and below right clavicle and over supraspinous fossa; on the left side rough inspiration with prolonged expiration in the same localities, and a few, fine crepitant râles were also noted in left supraspinous fossa. The sputum was mucous and contained no tubercle bacilli. Her temperature showed slight elevations from the normal toward evening, but at no time from October to January did it exceed 100.2°.

The diagnosis was "probably tuberculosis," with recent extension to the left side.

The treatment consisted in general hygienic and dietetic measures, systematic climatic treatment, and the use of the pneumatic cabinet with inhalations; the latter were continued for about six weeks, when the cough had disappeared.

For external reasons purified tuberculin was not employed until January, when, after repeated examinations, the local condition did not show any change whatever, and the temperature had shown a slight tendency to an increase. Maxima of 100° F. and over became more frequent in December, and the duration of elevation above normal had increased from a few hours in October to six or more hours each day.

On January 6th I began the administration of purified tuberculin, which has been continued to the present time, February 10th, in doses from $0.\frac{2}{10}$ to $1\frac{1}{2}$ c.c. daily. There has been no rise of temperature since January 20th; the pulse grew slower, and exertion had much less effect upon its frequency; the sense of exhaustion rapidly disappeared, and her general condition is improved in every way; she has gained five pounds in weight.

Locally, examination shows no longer any relative dulness below the right clavicle, nor supraspinous on the right side above the clavicle; however, the percussion note is unchanged, and continues relatively dull. Auscultation above the clavicle shows no change; on the left side the respiration, while not

yet ideally vesicular, has lost much of its rough character; the crepitant râles have disappeared.

Although the sputum contained no tubercle bacilli, we could scarcely expect to find them in this stage of the disease, and the diagnosis of tuberculosis is not impaired on that account; indeed, no other diagnosis seemed admissible, and the result of treatment with purified tuberculin confirms it.

The conditions which for three months remained uninfluenced quickly yielded to its use, with unmistakable changes toward normal condition in the abnormal phenomena elicited by physical examination and a prompt cessation of the attending fever.

If I am correct in my assumption that the lung symptoms at the age of eighteen were due to a circumscribed tuberculosis of the right apex, from which a relative recovery occurred at that time, and that the disease became again active and extended both in the right apex and to the left apex last summer, it is not likely that the relative dulness nor the harsh inspiration and prolonged expiration above the right clavicle will entirely disappear; these being undoubtedly due to fixed structural changes which occurred in the course toward recovery in the first attack.

If I am further correct, that from the right side the disease extended locally and also to the left side, there must have been some liberation of tubercle bacilli in the right apex, in connection with softening and absorption of caseous tubercle, and if more encapsulated caseous tissue is now there, a recurrence of such an accident is possible in the future, for it is not probable that the tubercle bacilli therein contained can be reached by the remedies at present employed, and which at most can bring about the state of affairs which existed prior to the extension; such a result will undoubtedly be accomplished, and when accomplished we shall have done all that can be expected in reason.[1]

[1] This patient has since been discharged, the left apex having returned to entirely normal conditions; the general condition of the patient improved further, with another gain of six pounds in weight.

The claims for the serum from animals treated with the culture-products of the bacillus, with the view of producing immunity, furnish additional evidence that the culture contains curative substances. Maragliano has worked in this direction for a number of years, and his persistent efforts deserve great credit; he was followed in France, and subsequently in this country, by similar efforts, and from the reports which I have seen within the last year Maragliano seems to have made advances in this direction which we cannot ignore, and which justify one in the hope that the serum-therapy will still be available in tubercular disease either alone or in combination with direct culture-products of the germ.

In the culture of the tubercle bacillus we have, on the one hand, the products of its vegetation, and, on the other, the bodies of the bacilli, which themselves contain substances, especially those which tend to the production of immunity.

Under the suggestion of Professor Klebs, we injected dead tubercle bacilli in guinea-pigs in the fall and winter of 1894–'95, and found, indeed, that the animals so treated showed a relative degree of immunity; but owing to the very limited absorption the work was given another direction after Professor Klebs took charge of our laboratory, chiefly in the use of extractives from the bodies of tubercle bacilli.

Their solution proved extremely difficult; a glycerin extract proved less efficient than expected, and the result from its use, although at times somewhat encouraging, did not justify any positive claims. Extracting them with ether or alcohol, Professor Klebs obtained quite unexpectedly two fats, one very soluble and of a red color, the other with a much higher melting point and of a white color.

When extracted, the two fats separate and both fats saponify, so that I can here show you the two forms of fat and the soaps which we have made. The germs when deprived of their fat lose their peculiar tinctorial properties.

Other extractives were thereafter made with the production of a nuclein, and with the latter some experiments were made upon animals which also proved unsatisfactory.

This status had been attained when our relations with Professor Klebs ceased; but the work was continued under my direction by Dr. Dunn, who had carried out the experimental details with Professor Klebs before.

After extracting both fats with benzol, then drying and powdering the tubercle bacilli, we found that larger quantities of extractive matter could be obtained by prolonged maceration in distilled water over a warm water-bath, but we finally arrived at a stage where no appreciable quantities were longer obtainable.

We next extracted with glycerin and water, and thereafter we added a small percentage of sodic hydrate to the water, and again obtained larger amounts of extractive matter by both methods; this finally failing also, we acidulated with hydrochloric acid and again obtained extractive substances. All these substances were collected separately, and at the end we had but a minute residue of the broken-up bacilli, which we believe to be cellulose only.

With these combined substances we undertook animal experiments with the view of determining their value in producing antitoxic and bacterial immunity. While not yet completed, I can say that our control-animals are dead long ago, and that those of the inoculated animals which received the greatest amount appear to live much longer and are progressing most favorably.

A series of larger animals—goats—were in the meanwhile injected with the products of the whole tubercle-culture, according to Maragliano, and after following for six months the injections exactly after the published method of Maragliano, serum was taken and compared, as to its antitoxic effect, with some of Maragliano's serum purchased from his agents in this country, with the result that both specimens of serum showed antitoxic properties as claimed by Maragliano, the animals surviving the minimum fatal doses of toxins, whereas the control-animals died within forty-eight hours.

To further increase the effect we now continue the injections according to Maragliano, but add increasing quantities

of the aforesaid extractives of the germ; while in the meanwhile the therapeutic effect of the obtained serum and that of Maragliano is being tried upon guinea-pigs.

Two years ago Professor Klebs used Paquin's horse serum in a series of animals for its curative influence, with, however, entirely negative results. Concluding that the serum was impure, we made serum from the horse ourselves, by Paquin's method, but it proved equally inefficient to influence the tubercular process.

The Paquin serum differs, however, in the method of preparation from that of Maragliano in essentials which would *à priori* justify the expectation that the latter would be more efficient.

In two series of animal experiments, involving the use of over one hundred guinea-pigs, the relative value of antiphthisin, of a tuberculinum purificatum, containing some of the toxic and extractive substances of the bacillus, Paquin's serum and Vaughan's nuclein were sought to be determined; in the first series the infections were made with large numbers of highly virulent germs, and treatment proved of no influence excepting that the animals which were treated with the purified tuberculin *containing the extruct* gave better results in living longer than all others and showing, on the whole, less advanced and more reparative changes when examined post mortem.

In the second series the number of bacilli used for infection was less; all the animals lived longer; the pigs treated with Paquin'e serum and those treated with nuclein died first, and before the controls. There was, however, the interesting fact that the nuclein pigs did not emaciate and were quite fat when they died. Again, the pigs which were treated with purified tuberculin, as above stated, outlived all others and showed the least pathological changes post mortem. I could at that time obtain none of Maragliano's serum for comparison.

This is as far as Dr. Dunn and myself have gone in the experimental work with serum, and I gladly acknowledge our

indebtedness to Professor Klebs in received instructions and help during his connection with our laboratory, without which we could not have gone on as well and done the work free from errors which has been accomplished within the last year. The details and final conclusions of these labors will eventually be published.

What the ultimate outcome in the production of antitoxic serum and antagonistic germ products will be, or what we will accomplish in the production of bacterial immunity, whether through germ products directly or through serum, our work does not yet show entirely, but that it will be accomplished in one way or the other we have every evidence to believe. The purified culture-products having given me such satisfactory therapeutic results in human tuberculosis, and being so peculiarly free from all reactions and unpleasant complications, I have not felt justified to use the serum or the tubercle-bacilli extract in the treatment of my patients, nor shall I do so until my experimental work has progressed further and shows their superiority, or until we have unquestionable therapeutic evidence from reliable sources in a large number of cases.

For experimental work I shall be glad to furnish specimens of the serum we made after Maragliano, and which appears equal to it in all respects, or the extractive substances of the bacillus which we have produced.

From the foregoing considerations it appears, however, that we are obliged to conclude that the culture-products of the tubercle bacillus, especially in the form of antiphthisin, purified tuberculin, and the extracts of the bacillus, such as I use in my clinical and experimental work, have an antagonistic influence to the bacillus of tuberculosis and to its toxic products, or both, and that they have peculiar physiological and therapeutic properties, and are of real value in the treatment of tubercular affections; it appears, further, that their effect is proportionate to the accessibility of the remedy through the circulation to the localized tubercle and to the degree of immunity which is produced during their administration.

Clinically we have learned that the purified products are absolutely safe and free from the toxic properties of crude tuberculin ; that they can be given in any stage and phase of the disease without incurring danger or even discomfort, and that while the results obtained in advanced cases are frequently only partial, and at times entirely negative, in the early stage these remedies are valuable and attended with unmistakably curative effects of a nature such as we have not witnessed from any other remedy.

I presume it would be more satisfactory to you if I could have presented all the evidence that has been accumulated in the course of six years for and against the belief which I entertain, if at the same time I could have shown you my views on all that pertains to tuberculosis, particularly to its etiology, pathology, and its course toward recovery or toward a fatal issue, and the manifold external and internal influences which are at work in favoring one or the other result, all of which would aid you in following any method of discipline in the examination of the evidence and would help you in testing the logic of any conclusions. This is necessarily impossible, implying as it would a voluminous book instead of a short essay.

Unable to present such voluminous details, I can only indicate to you in a more general way the character of the evidence; but I may say, that in examining it I have endeavored to make ample allowance for unconscious personal bias, which, if it exists in my case, must necessarily be in favor of the remedies, for who in search of them and in the hope that a real advance has been made, could help preferring a confirmative answer which would imply the mitigation, restriction, and more ready cure of a disease with a mortality such as we see in tuberculosis; and who is there that could repress feelings, more or less strong, which make him eager for success?

These feelings, although thoroughly humane, nevertheless become a cause of a naturally unconscious bias, and stand in the way of the necessary calmness by which

only one is enabled to recognize or infer one truth as well as another.

When the evidence is simple and direct, and the subject an uncomplicated one, and undesired truth is readily recognized and compels admission, the necessary mental discipline for its recognition is less ; but when, as in the present instance, the evidence is often obscure and largely circumstantial, and the subject greatly involved, it is frequently possible to offer some other explanation for what we see and believe to stand in relation to the responsible causes and observed effects.

Recognizing these difficulties, I have endeavored to be on my guard at all times; I have examined all other possible explanations of the observed facts and results, and have tried to accept only that which appeared conservative and rational in accordance with the evidence; but for such a course a much stronger paper could have been written.

Such being the case, I hope from my readers who may wish to differ with me an equally candid consideration and the recognition of the possible existence of an opposite bias, which may have resulted from past disappointment with new remedies, from theoretical considerations without evidence or with insufficient evidence, or from insufficient appreciation of the complexity of the subject. Confident of such consideration, I hope to have at least justified the conclusion that the field of bacterio-therapeutics in tuberculosis is a promising one; that something of real value has already been accomplished; that past experience points to a contained truth which it is an advantage to recognize, and which we must further strive to obtain in its purity.

Looking to the future, I am confident of progress and improvement in all our methods in phthiso-therapy, believing that bacterial products, especially the extractive substances of the bacillus, will play an important part; at the same time I cannot entertain the belief that, either through their agency or through other means, we shall reach a state where we can resuscitate and bring back to the normal, tissues which have so far degenerated that their state is incompatible with

systemic life; much less, that we shall be able to remove dead tissue artificially from the living organism by other than mechanical procedures. Such tissues must ever undergo the natural fixed changes which the peculiar existing conditions make necessary; they must be reacted upon and in turn react upon their immediate vicinity and upon the entire organism. These reactions not only influence the destiny and final disposition of the degenerated tissues and of the foreign dead tissue, but they also determine more or less the ultimate result.

In considering the often apparent insufficiency of curative influences, and especially of those which we supply or supplement in our therapeutic endeavors, we should constantly bear in mind that the true and full pathological changes and their advance toward irremedial conditions or toward conditions of greater peril to the patient than we supposed to exist, are not exactly known in the living subject, and that our expectation would often have to be modified if we could appreciate and know the true relations in the individual case.

Appreciating this we are admonished to leave nothing undone to bring our patients under the most favorable influences in the earlier stages of the disease, knowing that then the pathological changes are necessarily less formidable, and by doing this to reduce more and more the number of advanced cases who come under our care at a time when their treatment is nothing more than a justifiable experiment, in the frequent failure of which the remedies employed are not to be condemned on account of their natural limitations.

REMARKS ON THE TREATMENT OF TUBERCULOSIS BY THE ANTITUBERCULAR SERUM.

By GUY HINSDALE, A.M., M.D.,
PHILADELPHIA.

It has been ascertained that if a living culture of tubercle bacilli is injected into the veins of very old mare mules they will succumb to the disease in from the seventieth to the ninetieth day. Experience shows that if they pass over the ninetieth day they get well. By the one hundredth to the one hundred and tenth day the tubercle bacilli fade away, and even the tubercular nodules become lost. Tuberculin is present up to the one hundred and fifteenth day, but by the one hundred and thirtieth to the one hundred and fortieth day the tuberculin is entirely absent and the largest amounts of antituberculin are present. At the one hundred and thirtieth to the one hundred and fortieth day there is no tuberculin reaction, but the serum has the highest protective and curative properties.

The ass and the mule bear the injection of the tubercular products with a remarkable immunity as to inoculation beneath the skin. No appreciable reaction occurs except with strong doses of an emulsion of these products, when it is manifested by tension, heat, and sensitiveness at the point of inoculation during a period varying from four to six hours.

Intravenous inoculation by the auricular or jugular vein. No macroscopic phenomena, local or general, except a slight reaction of 1° C. in case of abundant injection. This immunity persists for inoculation more and more virulent and in greater quantity. The inoculations were repeated as many as six

times on the same subject and at intervals at first great and then shorter.

It has been found that the serum of the blood of the ass and mule treated in this manner was perfectly harmless for normal as well as tuberculous animals.

There is constant competency of serum presumed to be antitubercular in antagonism to tuberculosis of human origin in the case of the guinea-pig and rabbit. The post-mortem examination of animals thus treated showed that in the different organs a barrier of fibrous tissue enveloped the tubercular granulations. The lymphatics in the neighborhood were hypertrophied, and ganglions numerous.

The serum of the ass and mule not subjected to treatment has a weaker antagonistic action than in the case where treatment has been used. The action is strongest with the serum of animals first tannised and then treated at moderate intervals by feeble doses of tubercular emulsions at a high virulence.[1]

Boinet made experiments on guinea-pigs in doses varying from 6 to 16 c.cm. Most of the immunized animals remained immune. He advises in the human subject the use of 2 to 4 c.cm. of the serum in an injection; he has treated eight patients in this manner. In three cases of slow tuberculosis, apyretic, with crackling, the results were quite favorable. A marked amelioration was noted in two cases of tuberculosis in the second stage.

The treatment is useless where cavities exist; it is injurious in acute attacks with fever, hæmoptysis, night-sweats, and laryngeal complications.

Hericourt and Richet made what they term a phymosérum. They employed dogs and rabbits. The case which they report is as follows:

A woman, aged thirty-four years, without hereditary history, became phthisical following an injury to the lung. She had cough and occasional bloody expectoration and chronic laryngitis. Emaciation and night-sweats present. The sputa was abundant and purulent, with

[1] Redon and Chenot, Soc. de. Biol., June 29, 1895.

enormous quantities of bacilli. Crepitant, subcrepitant, and moist râles at the apices with dulness on percussion.

On *December* 15*th* she received $\frac{1}{10}$ c.cm. neoserum.
18*th*. 1 c.cm.
20*th*. 1 c.cm.
27*th*. 1 c.cm.
31*st*. 2 c.cm.
January 4*th*. 2 c.cm. In twelve days 5 c.cm.
8*th*. 3 c.cm.
14*th*. Bacilli very rare.

Viquerat says the antituberculin has the power of preserving the life of a guinea-pig which has been inoculated with tuberculin six weeks previously for a period of a year or more; and that it will cure a guinea-pig which has been infected three weeks previously.

In the preparation of the antituberculin which has been made in Philadelphia under the direction of Professor Joseph McFarland, in the Biological Laboratory of H. K. Mulford Company, a donkey was first injected with mallein to exclude the presence of glanders. He then received an injection of 1 c.cm. of tuberculin, and this dose was doubled every five or six days until he received 200 c.cm. at a dose. Very little reaction followed. The temperature rose only one to one and one-half degrees, and there was some slight local œdema.

After the maximum dose was given the animal was allowed to rest three weeks for complete elimination of tuberculin to take place. The animal was then bled, and the blood was allowed to stand in a refrigerator for five or six days. The serum was then collected, and one-half per cent. of trikresol was added to act as a preservative. It was then kept sealed in a cool place.

While it is too early to make any complete report of the clinical tests of this agent, I wish to record one case in which I have employed the serum, in the hope that it will encourage others to make a trial of it:

The patient was a married woman, aged twenty-seven years, who had a cough in February, 1896, and began, at that time, to lose flesh and strength. My notes, taken in March of that

year, are as follows: Right lung: Increased vocal fremitus, but not marked; bronchial breathing posteriorly; slight impairment of the percussion-note posteriorly; some râles at the apex. In April she weighs 120 pounds and is losing flesh, also coughs and has night-sweats. Right upper lobe consolidated; bronchial breathing on both sides, especially on the right; increased vocal resonance.

In May, amphoric breathing on the right side; coughs badly and has fever at night. Has been in bed one week, and has had a hemorrhage. Is pregnant.

Confined January 1, 1897. The physical signs all point to well-established phthisis.

I chose this case as being a test of the efficacy of any treatment, and had the sputum examined, with the discovery of a large quantity of tubercle bacilli.

January 16*th*. Temperature 98.5°. Injected 5 minims of the serum.

17*th*. Temperature 98.5°. Injected 10 minims of the serum. Injected 15 minims on the 18th, 20th, 22d, and 24th, and 30 minims on the 29th; 40 minims on January 31st. On March 2d, injected 40 minims of the serum; March 9th 20 minims.

March 25*th*. Weight 127 pounds. Has had some soreness below the left apex and in the back. There has been no rise in temperature and no unpleasant effects of any kind. All the injections were made in the left arm near the insertion of the deltoid, after carefully cleansing the part. There has been general improvement in all respects. The bacteriological examinations on March 9th and 15th showed absence of tubercle bacilli.

Examination, May 2, 1897. Percussion clear all over the chest, front and back; breath sounds clear; no râles. The only abnormal sign is a slightly increased vocal resonance over the right apex. The patient is steadily gaining in weight and strength, and has little expectoration. The progress of the case will be reported to the Association next year.

DISCUSSION.

Dr. E. A. de Schweinitz: I do not feel that I am in a position to discuss Dr. Hinsdale's paper, as I heard only a portion of it; yet, as I have been asked, there are one or two things that I would like to say. A few years ago I undertook the study of the tuberculosis germs. I found that they contained about 30 to 40 per cent. of fats. I then tried to separate the different acids, with the result that the fats were glycerides, principally of palmitic acid and high- and low-melting acids. The germs I used had been attenuated by artificial means purposely. About the same time Dr. Trudeau had been making experiments with an attenuated germ, and noted similar results to mine. He also found that the germs so attenuated were no longer capable of producing disease. I obtained some interesting results by first attenuating the germs and then inoculating guinea-pigs with them, and subsequently with virulent germs. In some instances complete immunity was produced. The next idea to be carried out was the preparation of the antitubercular serum. For this purpose I used various animals —rabbits, guinea-pigs, cows, horses, etc. Sometimes I used attenuated germs and sometimes virulent ones. At other times I used tuberculin. The serum obtained from these animals was used to treat tuberculous guinea-pigs, with fairly satisfactory results. This serum has also been used by Dr. Stubbert, of the Liberty (N. Y.) Sanitarium, by Dr. Trudeau, of Saranac Lake, and by Dr. C. W. Richardson, of Washington. All have reported improvement as regards the effect of the serum on the patients.

DIGESTION VS. DRUGS IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

By SAMUEL A. FISK, A.M., M.D.,
DENVER, COL.

About a year ago it was my privilege to visit, under favorable circumstances, the McLean Hospital for the Insane, at Waverly, Mass., where an entirely new plant has been erected at a cost of something like a million and a quarter of dollars, constituting one of the most perfect asylums for the care of the insane in the world. After being shown through the buildings and grounds, and having been absorbed in admiration at its completeness and the attention to detail shown, I asked what was the line of treatment addressed to the particular class of disease under observation, and was told, essentially, that it was "Food and Fresh Air."

A few days later I was at Saranac Lake, N. Y., and under the kindly guidance of Dr. E. L. Trudeau, was shown through the Laboratory and Sanitarium there, and I saw some of the results, known to you all, that he is accomplishing in the care of pulmonary tuberculosis. My inquiry was the same in regard to the line of treatment, and the reply was essentially the same, "Food and Fresh Air."

In contrast with this simplicity shown at two of the leading institutions for the care and treatment of two of the most serious diseases that attack mankind, I wish to call your attention to the mass of drugs that are vaunted, in medical publications and out of them, in the cure of disease, and, not the least of all, that are extolled and praised to the skies as useful in the arrest and cure of pulmonary tuberculosis. The

pages of our medical journals contain long and glowing accounts of such. The letter-carrier seldom passes our doors without leaving us some pamphlet or circular calling our attention to this or that remedy; and the agent besieges our offices and pesters the life out of us, if we will let him, and loads our shelves to groaning with sample bottles. How much good has come from all of this? Is the profession, is the patient one whit better off for this multiplicity of remedies? Have we advanced at all on the simplicity of "Food and Fresh Air?"

It seems to me that the profession itself is somewhat to blame for this state of affairs if it be bad, as I think that most of us will agree that it is.

I have in mind a patient who was getting, by actual count, eighteen different remedies in the course of the twenty-four hours; whose tongue was brown and furred so that you could almost plant potatoes on it; whose appetite was gone. His bowels were constipated, and his urine scanty, highly colored, and loaded with urates. He was being burnt up with fever, and yet he was certainly getting enough remedies. A little calomel and attention to the details of ingestion, assimilation, and egestion made a great difference in his condition, and he began at once to improve.

I also recall another patient who was receiving hypodermic injections and other treatment addressed to the bacilli, with a somewhat like result as was brought about in the previous case—furred and brown tongue, loss of appetite, constipation, scanty urine, and fever; where calomel, some salt of potash, and attention to food and fresh air brought about the surprising result that she obtained an arrest, or cure, of her trouble, and returned, with safety, to live at her home in the East.

All of this may sound like the simplest A, B, C, and I would not dare call it to the attention of this Association were it not that I am almost daily seeing such simple principles violated in fact.

The bacillus has assumed such monstrous proportions in

our eyes that he must be hunted and killed at any cost. It has been remarked that more patients have been killed with antipyrin than have died of the *grippe*—whatever that may be. I sometimes wonder whether the same thing could not be said of creosote and tuberculosis. My own experience has not been favorable to the use of creosote. I have seen it upset the digestion more often than accomplish anything else; and the best thing I can say for it is that it has the indorsement of a member of this Association, for whose opinion, based upon a large experience, I have great deference. In a large number of cases that I see, one of the first things that I have to do is to stop the creosote, and give calomel and potash.

In my opinion no drug should be administered which interferes with the digestion, with the proper nourishment.

Dr. Trudeau writes, in a recent article:

"At the sanitarium the utmost attention is given to the alimentation of the patient, and every attempt is made to induce him to take and digest as much nourishing food as possible. . . . Little stress is laid on the administration of drugs, except when necessary to relieve symptoms; but cod-liver oil, the hypophosphites, and arsenic are very generally made use of."

In 1889, in an article read before the Colorado State Medical Society, I said:

"I have seen patients with consolidation, night-sweats, constant cough, and profuse expectoration, accompanied by loss of strength and flesh, and, it may be, with hemorrhages, do admirably because they could eat, digest, and sleep; whereas, I have seen others similarly affected, go down rapidly because they could not eat, nor digest what they had eaten, nor sleep."

Two cases representing this difference, came under my observation quite recently. They were both young men, in the twenties; both students, one at college and the other teaching; they came from adjoining States, and were each affected with a rapid tubercular process, invading both lungs; they each had fever and sweats, with profuse expectoration, bacilli, shortness of breath, etc.; they had each lost strength and con-

siderable flesh, and the hearts of both were irritable. One could not eat nor assimilate, and he ran down rapidly, and was sent home, presumably to die; the other, as he expressed it, "ate like a horse," and he has made such improvement that in a month's time he has gained five pounds in weight; the pulse has fallen from 122 to 106; the temperature from 103° to 100.4°. His cough and expectoration have decidedly diminished; his chest is considerably drier, and his strength is greatly improved. In fact, he is on the highway to recovery. He has not been given any creosote, nor any drug to destroy the *bacillus*, but his digestion has been fostered.

And here, again, care has to be taken not to tax too severely the digestive powers. The enforced feeding that is often employed, especially when coupled with a life of inactivity, is apt to upset the digestion, if care is not exercised; and it is frequently a nice point to determine the limit of toleration. In fact, this ability to eat, to assimilate and eliminate, constituting very largely the powers of reaction in our patients, is to be most carefully guarded.

In chronic cases with considerable disturbance to the circulation, as in chronic bronchitis, asthma, fibroid conditions and emphysema, we are apt to find that the patient is prone to become bilious, and that the digestion has to be carefully watched. Ofttimes, nothing is better in these conditions, as in the passive hyperæmia from cardiac complications, than a good dose of calomel.

I have noticed in cases of hemorrhage, of which I have had a good many under observation this spring, that they were apt to be affected with constipation and with scanty and high urine, and I have used catharsis and diuresis with good effect The point that I wish to make is, that the digestion is the *pièce de resistance* in the treatment of pulmonary disease, to be fostered and protected at all hazards, and not to be sacrificed for any desire to destroy that arch-enemy, the *bacillus*.

It should not be necessary for me to define what I mean by the digestion. I know that I am not scientific in the use of

the term; but I mean the ability to eat, to assimilate, and to eliminate, in short, to nourish properly. These are old processes, but none the less vital, much more so, to my mind, than drugs. They should be the possession of every human being.

"Men and gods have not outlearned it,
And, how oft so e'er they've turned it,
Not to be improved."

TURPENTINE AS A REMEDIAL AGENT.

By JAMES B. WALKER, M.D.

Channels of ingestion, digestion, secretion, and ejection being possessed of mucous linings, and these, whether for air, food, secretions, or excretions, being so extensively distributed through the body, and all communicating directly or indirectly with that disease-laden environment, the external air, it is but little wonder that catarrhal diseases constitute so large a portion of human ailments. While most of these catarrhs disappear entirely soon after the acute symptoms subside, under the healing influence of the *vis medicatrix naturæ*, still many remain to harass the patient for an indefinite period as subacute or chronic catarrhs.

The experience of the medical profession with this class of disease has been very extensive during the past few years, since influenza has become endemic. Methods of treatment of these catarrhs must therefore be of interest to us; and from an extensive use of turpentine in these conditions I feel justified in presenting for your consideration some of its virtues. I wish, however, at the outset to disavow any inclination to pronounce it either a cure-all or of universal application, or that other agents in other hands may not be as efficient. Its action in subacute and chronic catarrhs seems to be that of a stimulant alterative; and as when given by the mouth it reaches, before elimination from the body, every mucous surface in a less or greater degree, its service is not a matter of much surprise.

There is no doubt it is also decidedly antiseptic, but its

value in this respect has not been agreed upon by the bacteriologists. The knowledge of the value of turpentine has been so long a part of medical lore, so much has been written by our fathers concerning clinical experience with it, that it would seem an unnecessary task to reiterate the facts concerning it. But truths are established and forgotten in medicine as elsewhere, and most of the written advocacy of this agent is buried in the pile of forgotten, and much of it well forgotten, lore.

The unceasing procession of new remedies, many of which are of great value and most of which claim at least passing attention, if not deeper study, crowds from view and from mind those of older fashion and use, and relegates them to a limited occupancy in our armamentarium.

On these accounts it is that I have chosen to claim a portion of your valuable time that I may present some facts, as I believe them to be, no one of which is altogether new and most of which may be familiar to every one present.

The virtues of turpentine, to which I desire to call especial attention, are those concerning its usefulness in *subacute* and *chronic catarrh* and as a *hæmostatic*.

George B. Wood established it upon a secure basis in the relief of typhoid ulceration, proving conclusively by its influence on the tongue and the "typhoid condition" generally the great value of the drug as well as establishing it as a hæmostatic in this class of cases. To use his own expression, "it is one of our best hæmostatics." J. Smith, of London, in a monograph on *Turpentine*, published in 1856, speaks of it in the same words. Hunter recommended it in hæmatemesis, and Graves and Seymour confirm its utility in similar cases. Aitken speaks of it as highly recommended by Budd; a Watson edition, 1872, says "it is recommended as a specific in hæmatemesis." Fagge says "some writers have spoken of it very highly." Horatio C. Wood gives it more generous recognition in his *Materia Medica* than most later authors. In speaking of its use in ulceration of the bowel he says: "In old gastric ulcer good results are sometimes

derived from its use." In the *Practice of Medicine*, by Wood and Fitz, he says, however, that in acute cases of hæmatemesis "it may not only not do good, but may prove absolutely harmful," though not suggesting how this harm is to be brought about. Other modern authors, so far as I have been able to consult them, whether in the elaborate systems of medicine or the less pretentious text-books, are absolutely silent on the virtues of this hæmostatic in gastric ulcer, though generous in supporting bismuth, silver, lead, iron, tannic acid, and other vaunted hæmostatics, no one of which is retainable by an excessively irritable stomach, and any one of which, by increase of emesis, tends directly to increase the hemorrhage. Referring to these authorities as to the treatment of catarrhal conditions or of hemorrhage from mucous surfaces, the great value of turpentine is almost invariably recognized as to the condition in typhoid fever, whether the object is to allay irritative diarrhœa, lessen tenesmus, modify the ulcerative process, or arrest hemorrhage; but in like conditions arising from other cause or in other disease the potentiality of the drug is forgotten.

One cause, I am sure, of the neglect of so potent a remedy has been the large doses (half-ounce) in which it was formerly given, and the distasteful emulsion which some would-be pharmacist foisted upon a gullible profession.

My first acquaintance with turpentine, barring some very juvenile personal experience with its administration on a teaspoonful of sugar for vermicidal purposes, was while a student of medicine. The case was one of ulcer of the stomach occurring in a previously healthy young lady, who was rapidly rendered almost exsanguine by the most excessive hemorrhages I have ever known. The ordinary remedies had not only failed to relieve, but each in its turn seemed only to aggravate the hæmatemesis, until the case seemed absolutely hopeless. At the suggestion of a lay woman who had known of a severe case of vomiting of blood which was arrested by turpentine, this was resorted to by Dr. Pawling, of Montgomery County, Pa., who had charge of the case. The first

dose was the first thing retained for days, and thereafter cure was rapidly effected without resort to other aid save the ice-bag, which had been in use from the first. Watching this case throughout and noting the almost marvellous action of this remedy after other so-called hæmostatics had each but aggravated the hemorrhage, until we feared to use any internal agent lest fatal hemorrhage might occur, established, to my satisfaction at least, the value of turpentine as a hæmostatic; and I have since used it in a number of cases of gastric ulcer in hospital and private practice, and have had my first impressions firmly established.

Its benign influence in irritable cases is inconceivable without personal experience, though I am satisfied a great deal depends on the method of administration. The best method in gastric cases with decided irritability is in suspension. The globule or capsule, forming a palpable mass, will often be rapidly ejected, whereas the diffusing vapors from the solution rapidly dispersing through the viscus may be retained. The best solution is not the gummy emulsion, unpalatable and nauseous to most, and which I think is to be named only to be condemned, but the solution made at the bedside, dose by dose, by stirring two to ten drops of oil of turpentine in an ounce or two of water well sweetened with the "saccharum anisi" of the German Pharmacopœia. The acrimony of the turpentine is by this means entirely corrected, if the proper amount of the medicated sugar is used; and both palate and stomach accept it readily, if not eagerly. This is the preferable method in administering it to young children for whatever purpose it is given, and for all cases at whatever period of life if an irritable stomach is to receive it.

Where an angry viscus or the age of the patient is not a consideration, the sealed capsule, soft or hard, is to be preferred. It might be added that this or any other volatile agent should never be administered in the bivalve capsule, so convenient for non-volatile substances.

In hæmatemesis from other causes than ulceration it may

serve as a valuable hæmostatic. In that arising from chronic alcoholism or in chronic venous engorgement from other causes it is more efficient than the astringents, and combined with hygienic necessities will often prove efficacious. If hepatic obstruction exists, it of course can only effect its hæmostatic purpose.

As an illustration of its gentle efficiency I will recite a case of its use in an infant. In August, 1896, Elizabeth F., aged three days, was noticed to be extremely pale, and on inquiry I learned she had been vomiting blood at intervals for two days, and her stools were tarry. Finding no cardiac cause for the same, I gave oil of turpentine as a hæmostatic, half drop every two hours, and there was no further hemorrhage, and the child throve uninterruptedly until it was four months old, when the hemorrhage was repeated and with equally effective use of the turpentine. I am sorry to admit that in neither case was I able to find the cause of the hemorrhage.

But it is not alone in ulceration, with or without hemorrhage, that turpentine proves itself a boon in gastro-intestinal troubles. In subacute and chronic catarrhal conditions it is of equal value. Its property of rapid diffusion distributes it throughout more or less of the entire intestinal tract and brings it into intimate contact with the catarrhal area more rapidly and more certainly than any non-volatile remedy, and applies whatever healing virtue it may possess more surely wherever it is required. In the past six years the proportion of catarrhal diseases has greatly increased, and in many case the gastro-intestinal tract especially suffers. Whether these cases are really cases of *la grippe* or merely seasonal or climatic catarrhal troubles, I leave to others to discuss; but we must all admit, especially those living along the Atlantic seaboard, that these catarrhs accompany other manifestations of *la grippe*, both as to time and place, and the terms *la grippe of stomach* or bowels may not be so markedly inaccurate as some claim. Even *appendicitis*, no longer attributable to wandering fruit-seeds, but recognized as often at least of catarrhal origin, has by its great multiplication in

the same grippe period emboldened me to believe that it *owes its origin in the great majority of cases to the same catarrhal cause.*

In these catarrhs of the stomach and intestines, after the acute symptoms subside, there is often left an irritability which lingers to annoy, and when in the stomach to even threaten life. The tongue in many of these cases has not the usual appearances suggesting turpentine, which have become classical. Often it is pale and but slightly furred, with a whitish or yellowish-white coat. And yet the stomach may reject all ingesta, even water; or it may be less irritable, with dyspeptic symptoms, and annoying chiefly because so persistent. In the bowels the pain is usually referred to the suprapubic and inguinal regions, accompanied by a sense of heaviness and a general feeling of languor and depression. For these conditions no remedy has served me so friendly a turn as the oil of turpentine. Of course, the hygienic indications have been followed also, and I would not have it understood for a moment that I advocate this or any other remedy to the avoidance or neglect of dietetic and other hygienic attentions. But of the remedies for such a condition turpentine outranks them all. Here it must be administered as before suggested, and where the stomach is non-retentive the solution in anise sugar water, small doses every two hours, is to be resorted to. In the other cases the five-minim capsule should be given an hour after meals, when it will be less likely to be regurgitated. An extra capsule may be given at bedtime if there is much tympany or irritation.

I could give numbers of illustrative cases to support what I have asserted, but perhaps all are as familiar with this use of the drug as I am myself. The look of surprise on more than one physician's face when I have suggested this remedy for such a condition, however, causes me to believe that its value in such cases is not universally appreciated; and I may add that the enthusiasm with which these same physicians, after using it, speak of it establishes me the more firmly in my estimation of its value.

In catarrhs of the respiratory system after the acute symptoms have subsided, where a free secretion is present or where the catarrh persists, with or without localized, subcrepitant râles, so frequent in lingering attacks of influenza, its value is exceptional. Being excreted in part by the pulmonary mucous membrane, it reaches directly from within the surface and *even the cells of the tissues involved.* It is greatly preferable to the ammonia salts, because more efficient and more acceptable to palate and stomach. In the more chronic cases, where creosote and guaiacol are recommended, it has been in my hands equally efficacious and often less objectionable.

In the bronchial catarrhs of the aged and the infirm of any age its stimulating qualities as well as its local alterative effect make it invaluable.

In the catarhal conditions of phthisis, especially when bronchorrhœa is present, even where the secretion is only fairly free, its remedial effects are easily appreciated; and here, again, whether cavities are present or not, it should take rank equal if not superior to creosote and guaiacol. In the hemorrhages of phthisis, as I have already stated before this Association, it should hold first rank among drugs. Here, as in intestinal catarrhs and hemorrhages, its internal administration may be supplemented by its external use in form of a stupe, although in some, perhaps most instances, the ice-bag is preferable for external application.

Inasmuch as the renal shares with the pulmonary mucosa in its elimination, it finds opportunity for service in chronic catarrhs of the urinary tract. I have not used it in chronic catarrhal nephritis, but believe that, cautiously used in small doses in cases under close and frequent observation, it will often serve us a good turn by arresting the almost hopeless maiming to which the renal mucosa is subjected in this form of Bright's disease. Certainly in chronic vesical catarrh, with or without enlarged prostate, it has proven of much value in a few cases where it has been given. In chronic cystitis and urethritis of gonorrhœal origin it is of extensive usefulness, its

action being similar to, though I believe more certain than, the oil of sandalwood so generally employed.

In hæmaturia it has the same virtue as a hæmostatic as in other mucous hemorrhages.

I could recite a number of instances where in metrorrhagia without tumor or other palpable cause turpentine has served me a good turn.

Upon its action as a diffusible stimulant affecting the system generally, and especially the heart, and through the improved circulation the entire economy, I will not dwell at this time.

DISCUSSION.

Dr. Newton: Among the other virtues of turpentine, I do not think that Dr. Walker mentioned its excellence as an application to wounds. This is so well known that I need not enlarge upon it.

A lady present has called our attention to the fact that turpentine is also of value in nose-bleed.

AËROTHERAPEUTICS AND HYDROTHERAPEUTICS IN THE TREATMENT AND PREVENTION OF PULMONARY TUBERCULOSIS.

By S. A. KNOPF, M.D.,
NEW YORK.

Preventive medicine can no longer be called the medicine of the future, for it has become the medicine of the present. All the great advances made in the art of healing by the present generation of medical men have been in the direction of preventing rather than curing disease. Serotherapy, the latest and most marvellous attainment by which we immunize, check further invasion of the micro-organisms and neutralize their toxins when the disease has been already established, is preventive medicine, indeed. And who will dare deny that before long we may be able to employ serotherapathy successfully for all acute diseases? But may we cherish the same hope for chronic disorders where destructive processes have been going on for years, as, for example, in pulmonary tuberculosis? I confess freely that I cannot. Although the great Koch has told us recently that he has perfected his tuberculin to a degree that he can safely recommend it to the profession, it seems to me difficult to believe that we ever will have a serum or tuberculin which in a few weeks, even with numerous injections, will be able to produce enough fibrous connective tissue to strangle countless tubercles which it took years to form, or to create enough phagocitic blood-corpuscles to swallow myriads of bacilli. We may employ serotherapy in acute exacerbation due to an association of microbes, and my own experiments have taught me its value

in presence of the streptococci.[11] But to heal a tuberculous lesion we must produce new tissue; we must feed our patient, and feed him well. To increase his appetite and his powers of assimilation I know of no better means than the judicious employment of aëro- and hydrotherapeutics.

Will it ever be possible to render an individual immune from tuberculosis by the injection of a tuberculin or serum, as it is possible for us to do in diphtheria and variola? It is certainly not so yet. But these are not the only means to fortify the system against the invasion of disease. While consumptives, through ignorance and carelessness, may spread the germs of their disease everywhere, and lack of universal legislation leaves us in danger of becoming infected through tuberculous cattle, if the teachings of modern phthisio-therapeutics are followed, even the child of tuberculous parents may become a strong, healthy man or woman, and the accidental inhalation or ingestion of the tubercle bacilli will not suffice to make a consumptive of him or her. The experiments of my lamented teacher, the late Professor Straus, of Paris,[16] and his pupils, Wurtz and Lermoyez, have shown beyond a doubt the frequent presence of tubercle bacilli in the nasal mucus of healthy individuals. But their experiments have, at the same time, demonstrated the bactericidal quality of healthy nasal secretion.

A predisposition to pumlonary tuberculosis may be inherited or acquired, but in either case the means to overcome this peculiar susceptibility are the same.

Let us examine, for a moment, an individual predisposed to consumption, and we will be better able to understand the reasons for the therapeutic measures which I shall describe. If it be a child he will be either undersized or present an almost abnormal height for his age, with a narrow chest. He will be a bad eater, irritable, nervous, anæmic, with irregular digestive functions, at times constipated, at times suffering from diarrhœa, prone to all the diseases of childhood, and still mentally rarely behind his more robust companions. He is averse to outdoor play, and owing to his delicate con-

stitution he is allowed to have his way, and his character is often spoiled.

The adult candidate for pulmonary tuberculosis differs from his younger brother but little; the physique is the same; the peculiar condition of mind is more pronounced; while sanguine at times, anxieties, disappointments, especially unfortunate love affairs, and similar sorrows often suffice to bring about a rapid development of the disease. One in sorrow eats but little, the arterial pressure is low, the muscular weakness and depressed nervous state make the act of breathing incomplete; the beneficial influence of natural and full breathing does not exist any more, the heart is called upon to do more work, and a perpetual palpitation ensues. The circulatory disturbances in the lungs impair the nutrition of this organ, and thus the field for the invasion of the bacillus of tuberculosis is prepared.

The decreased power of resistance makes this anæmic individual, in addition, especially prone to acute inflammation of either the mucous or serous membranes, and catarrhal conditions of the upper respiratory organs become alarmingly frequent and inclined to descend into the deeper air-passages. And why do these people take cold so easily and frequently? Because their vasomotor system is impaired, and the slightest change of temperature or insignificant exposure of some part of the body usually covered suffices to hinder the peripheral circulation to the extent of producing congestions and to impair the process of elimination of used-up substances whose toxicity increases with the length of time they are retained.

It seems, then, evident that the insufficient air supply to the respiratory organs, and the increased susceptibility to the slightest change of temperature are the principal factors in the production of consumptive individuals. Therefore, to prevent or improve the condition caused by an insufficient air-supply, we must resort to aërotherapeutics, and to arouse the vasomotor system to a more energetic action we have in hydrotherapeutics not the only but, considering its salutary secondary effects, the most valuable therapeutic agent.

To prevent pulmonary tuberculosis we must begin with treating the child in utero, continue in the lying-in room, nursery, and school-room, and teach the young man or woman to keep the treatment up throughout life. A woman who is to give birth to a child should abandon the corset and tight clothing in time to allow a continued free abdominal and thoracic respiration. Wiser yet if she had never been addicted to the habit of tight lacing, for the experiments of Kellogg[10] and Mays have demonstrated the fact that the so-called female or costal type of respiration, which prevails among civilized women, is the result of their restricting and unphysiological mode of dress, and is not due to the influence of gestation or to a natural difference in the anatomo-physiological growth of man and woman.

For the mother to live as much as possible in pure fresh air, to take frequent breathing exercises, to avoid crowded assemblies, where the air is vitiated, and live, in short, as hygienic a life as circumstances will permit, will have a most salutary effect on the child's future health. The newborn child is in need of pure fresh air as much as the mother, and the lying-in room and nursery should always be well ventilated. When the child, in time, is taken for an airing the thick, almost impermeable veil should be abandoned. These veils, often tightened around the little face, press against the nose and make it difficult for the child to breathe naturally, and the mother wonders why the baby got in the habit of breathing through the mouth.

I consider the air-bath and sun-bath for children at the earlier age most beneficial. Let the little ones toddle around naked every day for a little while, in cold weather in well-warmed rooms, and in the summer in the room bathed by the rays of the sun. They will become less susceptible to colds than if always carefully bundled up. In localities where it is impossible to prevent the constant inhalation of coal-dust or other irritating substances, a regular nasal toilet with a mild antiseptic solution, or, perhaps best of all, plain tepid, but previously boiled water, should be instituted for little

children until they are old enough to blow their noses properly.

As soon as the age and intelligence of the child will permit, breathing exercises should be taught him. He should learn to love them as the average child likes general gymnastics. Our school-rooms should be model localities for ventilation, and to teach the children how to breathe, sit, stand, and walk properly should form a part of the everyday curriculum. Every school should have its large playground or roof-garden where, weather and season permitting, the classes should alternately receive their instruction. In rural communities during the warmer season instruction indoors should be the exception, not the rule. Singing and recitation especially should be encouraged out of doors.

Before closing the subject of school hygiene I cannot help recalling here the words of my friend, Dr. W. W. Hitchcock, to whom I had the good fortune to listen when attending last year the California Sanitary Convention in Los Angeles.[7]

In speaking of the gymnasium as a sanitary measure, he referred to the frequent lack of the develompent of the thorax, particularly noticeable in those predisposed to pulmonary diseases, and said: "There is no doubt that if as much care were bestowed on our young in seeing that this particular part was developed with that care that the brain receives, tuberculosis would almost disappear." These words impressed me deeply, for they contain much truth.

Hydrotherapeutics, as a measure to prevent pulmonary tuberculosis, tends to develop to a more energetic action the vasomotor system, and should also be instituted at an early age. A child a few months old can support with immunity a rapid sponging off with cold water, followed by a relatively viogorous friction with a soft Turkish towel, after its warm bath. As the child grows older it should not only be taught this use of cold water after its semi-weekly or weekly bath, but he should wash at least face, neck, and chest every morning with cold water. The utility of all-the-year-round swimming baths, where old and young of all classes can, gratui-

tously or for a moderate price, enjoy the salutary effects on body and mind of a good swim, is too well known to need repeating.

For anæmic individuals who, as I stated above, are, in the majority, candidates for consumption, a graduated course of hydrotherapeutics seems to act almost as a specific. That there is never any danger from a judiciously applied effusion or douche has been demonstrated by years of practice. And why should there be? All that is necessary is to assure a proper reaction and an education of the skin and nervous system before the classical douche is applied. Herein I make no exception, whether the patient is simply predisposed, an anæmic, or a fully developed consumptive. I begin with a dry massage for several days and sometimes weeks. If the skin is particularly dry I use, in addition, inunction with some fatty substance, preferably cod-liver oil. Next, for about the same period of time, comes the friction with pure alcohol, then with half alcohol and water, finally the friction with water alone; then comes the cold sponge-bath, the affusion, and at last the douche. The friction with the hands directly in contact with the skin, or over a large towel after the douche, should always be kept up until the patient is thoroughly dry and warm. A short promenade or a return to bed should follow according to the indication of the case. The cold douche should never last longer than twenty to twenty-five seconds, and one should always go gradually, not giving more than five seconds at the beginning. The temperature may vary from 40° to 60° F. for ordinary cases.

My favorite way is to apply the douche first in the form of a spray uniformly over all the body, and direct a narrow jet with little more force over the apices. In private practice, and in such cases where the visit to the douche-room is either inconvenient or not safe, I resort to the following simple method. A wooden chair is placed in a large circular English bath-tub, and the patient sits astride the chair, holding the back with his hands and bending his head slightly foward. Then two, four, or more pitchers of cold or tempered water

are rapidly poured over the shoulders. In cases where the reaction is feeble the patient is quickly put back into his warm bed, even if not thoroughly dry.

The best time to take the hydrotherapeutic application is in the morning, half an hour or so after a very light breakfast. Patients accustomed to our heavy American breakfast should take such after their douche and morning walk, but should take a glass of milk with a slice of buttered toast before leaving the room.

In some cases I find it wise, in order to overcome the fear of cold water, to commence with only partial affusions or spongings. The complicated procedure of the dripping sheet seems to entail too great a strain on the patient, and I do not favor it in phthisio-therapeutics. Wet packs, on the contrary, over the thorax seem to exert a soothing influence whenever there are pleuritic or intercostal pains or that vague and undetermined feeling of discomfort in the chest. In persistent hyperhidrosis I have obtained satisfactory results by the following method in many cases where the best-known medicinal agents to combat night-sweats had failed. Several thicknesses of rather coarse linen folded in the form of a shawl are soaked in water at a temperature of about 55° F., wrung out, and then closely applied over apices and around the thorax. A thick flannel band, somewhat wider than the compress, is wrapped over this, and the whole fastened in place, and remains thus all night. The patient usually feels no discomfort, sleeps well, and sweats but slightly, if at all. In the morning the compress is removed and chest and shoulders are rubbed thoroughly dry by a gentle massage.

Lateral douches, not too strong, directed toward the site of old pleuritic adhesions often aid considerably to cause a resorption of the fibrinous bands and a consequent free chest expansion.

Hydrotherapy renders finally excellent services in hæmoptysis. It must, of course, be applied without disturbing the patient, as absolute rest is the first and alli-mportant indication. While cracked ice in bags over heart and apices is,

perhaps, the most efficacious local anti-hemorrhagic remedy, since ice is not always on hand when it is most urgently needed, and the weight of the bags, on the other hand, becomes sometimes oppressive to the patient, the following method of applying cold water when in the presence of hemorrhage of the lungs is, I think, well worth remembering. It was, I believe, first instituted by Winternitz. One procures the water as cold as possible and soaks in it a part of a sheet or a piece of rather coarse linen. When wrung out so that it does not drip the cloth is folded in the shape of a triangle and placed closely over the patient's chest and pressed into the supraclavicular spaces. The apex of the triangle reaches over the pit of the stomach, and the base touches the neck. Whenever the compress becomes warm it can be rapidly changed without disturbing the patient's position. The cooler and more frequent the application the more rapid is the action of the vasoconstrictors.

We now come to the subject of aërotherapeutics proper, and I desire first to consider it as applied to patients in the sanatorium. It is there where the consumptive is made almost to live out of doors, and is always surrounded by a fresh, pure atmosphere. For six to eight, sometimes ten hours a day he remains on the open veranda on his comfortable steamer chair, in a position allowing complete muscular relaxation. The weather has little influence on the feasibility of this out-door rest-cure. In Falkenstein the patients remain out doors in spite of rain, fog, snow, or any other kind of weather. Only very intense east winds are an indication for shortening the "Liegekur." Dr. Andvord, of Tonsaasen, Norway, wrote me that he leaves his patients out of doors on their chairs, wrapped up in their furs, from five to nine hours a day at a temperature of —13° F. The air-cure must, however, be begun by a short stay, which is gradually prolonged as the patient becomes accustomed to it.

The recreation-pavilion, library, parlor, dining-room, etc., are, of course, well ventilated, and at night the patient sleeps with the windows open—entirely open in summer, partly so

in winter. It is to this living constantly in pure, fresh air, the "Dauerluftkur" of the Germans, that the good results of the sanatorium treatment must, to a large extent, be ascribed. The air-cure on the veranda should be alternated by graduated promenades—that is to say, walks on paths varying in inclination from one foot in three hundred to one in sixty. Every half hour or so the patient should rise from his chair to take his breathing exercise. I have experimented on myself and with patients, with the various mechanical devices and appliances, and have abandoned them all. I have learned that the simple exercises without apparatus are not only just as efficacious, with less danger of being overdone, but the patient is also more likely to carry them out.

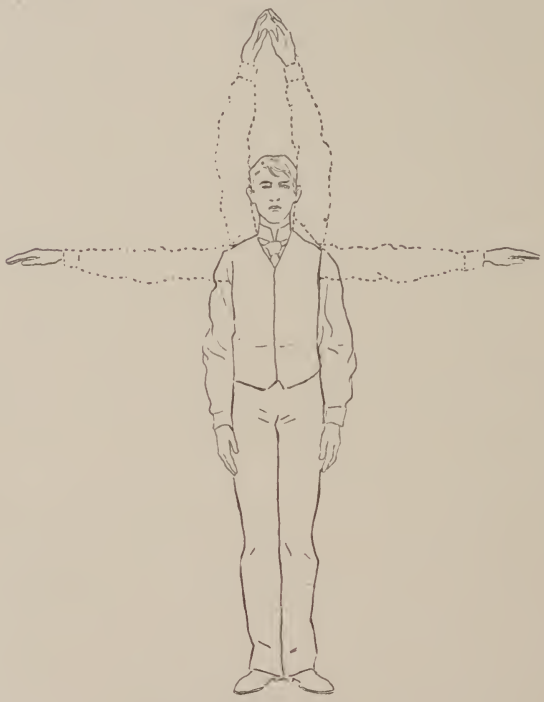
The following is a description of the exercises I recommend to the chronic tuberculous patient able to walk about, to the anæmic, the predisposed, and to all children and adults who breathe faultily; these are also a part of the gymnastic exercises I should like to see incorporated into the curriculum of all our schools, and not only in the selected few. They are essentially the same I have described in various previous publications, and I can recommend them as practical, efficacious, and easily learned.

The patient is taught to stand properly and to breathe always through the nose. He takes a deep inspiration slowly while raising the arms from the sides to a horizontal position, holds the breath for a moment, and lowers the arms during the expiration, which should be somewhat more rapid. The second exercise is like the first, except that the upward movement of the arms is continued until the hands meet above the head. (Fig. 1.) In the third exercise the patient stretches his arms out as in the position of swimming, the dorsal surfaces of the hands touching each other. During the inspiration the arms are moved outward and finally meet behind the back. They are brought forward again during the expiration. (Fig. 2.) Each respiratory act should be followed immediately by a secondary forced expiratory effort. This is for the purpose of expelling as much of the supplemental air as

possible, and may be effectually aided by supinating the arms and pressing the thorax with them.

If you consider that the amount of tidal air—that is to say, the volume which is inspired and expired in quiet respiration, is only 500 c.c., the complementary air, the volume

FIG. 1.



First and second expiratory exercises.

which can be inspired after an ordinary respiration, is 1500 c.c., and the supplemental, or reserve air, the amount of which can be forcedly expelled after an ordinary respiration, amounts to 1240 to 1800 c.c., you can readily see the value of respiratory exercises and also the utility of this second expiratory effort. The fact that in the majority of cases the tuberculous process begins at the apices has been explained by the sup-

posed bad inspiratory function of this part of the lungs. Now, I agree in this respect with Hanau, and consider the almost universally adopted statement of the deficient inspiratory function of the apices erroneous. On the contrary, these portions of the lungs inspire excellently well, almost too well,

Fig. 2.

Third expiratory exercise.

for dust and all sorts of micro-organisms enter there most easily and are found in large quantities in careful post-mortem examinations. What is faulty is the expiratory function of the apices. A thorough *expiration*, followed by a forced expiratory effort, as described above, is, to my mind, the only possible way to improve this defect and prevent

stagnation and congestion which, as is well known, form excellent media for the development of bacilli.

To consumptives who have the habit of stooping, I teach an additional exercise as follows: The patient makes his best effort to stand straight, he places his hands on his hips with the thumbs toward the front, and then bends backward slowly

FIG. 3.

Exercise for stooping patients.

as far as he can during the act of inspiration. He remains in this position a few seconds while holding the breath, and rises again somewhat more rapidly during the expiration. (Fig. 3.)

When out walking anyone can take the following exercise without attracting attention. Raise the shoulders as high as

possible, and then move them backward while breathing in. Hold the breath a moment in this position, and then lower the shoulders while breathing out. Follow this by the forced expiratory effort.

While it is true that whenever there are old pleuritic adhesons these extra respiratory efforts may cause moments of pain, the patient must bear in mind that these pains are not lasting and are in reality salutary, being caused by the loosening of the fibrinous bands.

By these breathing exercises the respiratory muscles become developed, the process of hæmatosis more complete, and the increased respiratory function helps to dissolve the mucus and makes cough and expectoration more easy. More advanced and very weak patients must content themselves with deep but quiet respirations without movement of the arms. Placing a pillow under the back of these patients, so as to realize somewhat Sylvester's position, employed when artificial respiration is necessary, will be found a valuable adjuvant.

A persistent high temperature without apparent cause is often best treated by absolute rest; in such cases as well as during acute attacks of inflammatory processes or active hemorrhages it is, perhaps, best to suspend all respiratory exercises. On the other hand for those chronic, continued, bloody expectorations most probably due to a congestive process, regular breathing exercises act most beneficially. No less an authority than the great immortal Traube, was the first to prescribe this method for chronic hæmoptysis.

In emphysema of the lungs the exercise must not be the same as those I have recommended as prophylactic and curative measures in pulmonary tuberculosis. There should be more abdominal breathing; instead of the inspiratory, the expiratory act should be prolonged; and particular attention should be paid to the second expiratory effort. During the *inspiration* a considerable pressure with the palms of the hands should be exerted over the chest, and holding the breath after the inspiration should be omitted.

For all patients alike the rules hold good never to take their breathing exercise when tired or immediately after a heavy meal, never to continue them to the extent of becoming tired, never to take them in a bad atmosphere, and not to take them at their caprice, but according to the directions of the physician.

In prescribing breathing exercises a careful medical examination is essential, and the effect of the exercises should be controlled by regularly repeated examinations.

Finally it cannot be impressed too strongly on the minds of consumptives and those predisposed to the disease that they should always seek environments where the air is as pure as possible. Lord Beaconsfield's celebrated words, quoted by English, "The atmosphere in which we live has more to do with human happiness than all the accidents of fortune and all the acts of government," has, I think, a special meaning for this class of sufferers.

We have in aërotherapeutics and hydrotherapeutics most precious means of treating and preventing, in a large measure, this disease which yields so little to medicinal treatment. May the little exposition I have given you of what I believe the best methods to apply these agents tend to encourage their more universal use. So may it be said that with nature's kindest and most abundant gifts we are able to combat one of humanity's most bitter foes.

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DANGERS OF TUBERCULAR INFECTION AND THEIR PARTIAL ARREST BY CLIMATIC INFLUENCES.

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In reviewing the evidence of partial arrest of tubercular infection by climatic influence all data of a general character have to be taken with great caution. The impression that in the arid or elevated regions of the world, consumption, from being so rarely seen, is not communicated from the sick to the well, is not at all proved from such imperfect and unreliable statistics as have generally been brought forward. The immunizing power apparently possessed by a climate may be really due to manner of life, such as isolation, and a life, day and night, in the open air, or selected lives, such as the early settlers of any country live, who, to cope with its hardships, have of necessity to be the strongest.

It is, therefore, only after a country has been settled for a considerable time, and when indoor industries, over-crowding, and the general unsanitary environment of civilization exert their full action, that any reliable data concerning climatic arrest of infection can with real accuracy be computed, since no experiment is accurate unless conditions are equal or nearly so. Conditions are now, however, favorable for comparison, as the dry and elevated regions of almost the entire world have populous cities, whose inhabitants lead indoor lives and whose environment closely approaches that of the dwellers in the dense, civilized centres from which our statistics have

for years been taken; so that at the present day comparative statistics of tuberculosis, collected with care, show the relation between a seaboard town and one at an elevation of six thousand feet with a degree of accuracy and truth that leaves very little to be desired in a collection of scientific data.

I shall not burden you with a long list of dry details regarding the immunity conferred by different climates in cases of pulmonary tuberculosis. It has been found, as you are no doubt aware, that in certain elevations above the sea consumption has occurred very infrequently. On the high table-lands of India, of Africa, of the valleys of the Andes, in some parts of Switzerland, etc., consumption seems to be a rare disease, even when the population at this elevation (from three thousand feet upward) is largely an industrial one, and when, as in South America and other places, the natives are crowded together, favoring contagion, and have food not adapted to proper nutrition; still the rate from tuberculosis is very small as compared to the rate of deaths from this disease among the same people living at a lower altitude, although other conditions, except the factor of elevation, are the same.

It is a law well established that consumption, among all races and in all climates, diminishes in a progressive ratio as we ascend from the sea-level. There are, however, exceptions to this law, but they are more apparent than real; as, for instance, in Iceland consumption is a very rare disease, as in the Hebrides and Faroe Islands, also among the inhabitants of the Russian steppes. Parts of Algiers, also, have a singular immunity; but it is well to remark that to a great degree the immunity ceases to be observed when the inhabitants of the countries are brought into contact with consumption, as in the Sandwich Islands, where it was not known until the advent of the white man, or when these natives change their mode of life, as to industrial, indoor occupations from agricultural, outdoor ones. These factors act quite as readily in trading stations in North Greenland as on the borders of the Soudan.

Elevation is the only climatic environment which seems to confer any marked immunity, as I shall show from the histories of cities situated much as those in Colorado, where, notwithstanding overcrowding, indoor occupation, contact with tuberculosis in every form, the increase of death-rate from non-imported consumption remains insignificant. Undoubtedly this is the effect of the high altitude.

There is, however, no absolute safety, no non-phthisical line to be drawn at a certain elevation. A few cases do occur at any elevation. I myself have seen three deaths from acute tuberculosis in renegade Ute Indians who had never been out of Colorado or Utah or been lower than six thousand feet; who had never lived in a house and who did not use milk or beef for food; who assured me they had never seen or been near a white man or Indian with a cough. I also saw some months ago a white man, an American, a silver miner, who had lived in the hills of Colorado for twelve years at an altitude of never less than eight thousand feet, far from any town or any one ill in any way, and whose food, air, exercise, and family history, etc., were ideally perfect from a health standpoint; yet this man had lost some forty pounds in weight in four months, and presented a typical case of phthisis in the second stage, with bacilli in sputa, so that no absolute immunity does exist from consumption in mankind due to altitude and its effects. Cases do occur, as I have shown, even under the very best conditions and at a very high altitude.

The fact, however, that its occurrence is so infrequent, and that as we ascend higher and higher from the sea-level the cases are more infrequent, when other conditions remain the same, points to some definite climatic power at work which renders mankind less susceptible to invasion of tuberculosis at certain elevations.

It has been to determine, if possible, what this protective influence is that I have been for the last few years engaged in investigation. I live in a city well adapted climatically for the purpose. Colorado Springs is at an altitude of six

thousand feet. It has fourteen inches of annual rainfall, and, as you know, lies in our great, so-called "dry plateau," the peculiar advantage being that it is well within the limited non-phthisical belt, and has a population which has been engaged in indoor occupations for years, as in any Eastern city, besides having a large percentage of people infected with tuberculosis scattered among those who are well. For some twenty years consumptives have been coming to Colorado Springs, and the permanent population has been brought into close contact with them, so that, theoretically considered, and from the standpoint of contagion, the population of Colorado Springs has been more exposed to the danger of infection from tubercular dust than the average city, and therefore should show at least a very large percentage of non-imported cases of consumption every year, or that climatic influence must arrest contagion if other things are equal.

To determine the climatic effect, if any, upon germ-life I first considered the air, or, rather, the dust contained in the air, and the germ-life carried by this dust. The non-pathogermic micro-organisms were first taken up. The first experiment was simply to expose a Petri dish, averaging about three square inches in area, the bottom covered with a thin layer of nutrient gelatin. After having been properly sterilized these dishes or plates and gelatin are placed for a definite time in a certain place, and the germs and spores of moulds gradually settle upon the surface of the gelatin. This gelatin, covered and put away, develops a colony where each germ has fallen; and by counting the colonies one can tell how many germs or moulds have fallen during the time of exposure. These exposures were made for two years during every month in the year, and every hour of the twenty-four, indoors and out. The comparative number of germs can best be shown by comparative tables. The germs I now speak of are not, be it understood, germs of disease, but the comparatively harmless ones common to all cities and countries. At the same time their number in a given space of air is a standard of its purity, and to a certain degree the number of harmless germs is more

or less an indication of the number of harmful ones, such as consumptive germs, scattered among them.

I find that from one part of Colorado Springs compared to a like place in New York City, as nearly as any comparison could be made, the following (taking as a standard of comparison of the analysis of Dr. Prudden, of the College of Physicians and Surgeons of New York City):

New York.	*Colorado Springs.*
Central Park, 499	Pike's Peak Avenue (near Tejon), 89
Union Square, 214	Alamo Square, 23
Private houses, 34	Private houses, 39
Dry-goods store, 199	Dry-goods store, 99
Street being cleaned, 5810	Tejon and Huerfano Streets (strong wind blowing and dust), 753

We see, therefore, from this, that although our air is not at all free from dust and germs, it still has only a moderate number, and these only in city limits.

As the plate method, however, is subject to error, I supplemented it by Miquel's method, which is to draw a given quantity of air through a tube filled with granulated sugar or sand of a certain sized grain. This sugar or sand acts as a filter, and when air is drawn though it by air-pumps all germs contained in the air are entangled in the sugar. This sugar is then dissolved in gelatin and the gelatin is put away. By counting the number of colonies developed in the gelatin we know how many germs were in the air drawn through the sugar in the tube. I found by this more elaborate method practically the same result that I had obtained by the plate analysis. I made in all several hundred experiments. A careful record was kept of all meteorological conditions, such as temperature, wind, sunshine, character of ground, height from ground, visible dust present in the air, etc. It was found that, as is usual in all cities of all climates, the germs increased in a regular ratio as the dense centre of population was reached and more dust was raised in the air by traffic. The actual tables would be too lengthy for this paper, but the main fact was established that the air of the prairies was absolutely germless. I applied the most crucial

tests to determine this point, taking as much as ten cubic meters of air at one test, and extending my observations from twenty miles out on the prairies up into the foothills, at least to an altitude of ten thousand feet, deep down in some of our cañons, in dense timber, and again on exposed rocky ridges, and the result was always the same, provided I had used the utmost care against accidental contamination. The air of the prairies and mountains I found absolutely sterile and germ-less; when, however, I approached any ranch, with buildings, near barns, houses, etc., as on the outskirts of towns, I invariably found germ-life more or less frequent.

The comparative tables are as follows:

	Bacteria.	*Moulds.*
Dr. T. M. Prudden, of New York, average number of germs in lecture-room in ten litres of air . . .	10	14
Colorado Springs Opera House (just after performance)	15	10
Dr. Connelly, in Dundee (Scotland) Hospital, in ten litres of air	10–20	...
Dr. Tucker, Boston, Mass, in hospital, in ten litres of air	20	12
Dr. Prudden, in New York in various hospital, in ten litres of air	127	25
Colorado Springs in various sanitariums and hospitals, in ten litres of air, an average of about . . .	23-50	11
In private houses an average of	12	4
Dr. Frankland, in open space in London, found in ten litres of air	35	...
Fell on roof of South Kensington Museum, on one square foot in one minute	279	...
In Hyde Park, in ten litres of air	24	...

From the above comparison it can be seen that in the dry, elevated climate of Colorado Springs the ordinary number of non-pathogermic, micro-organisms are present indoors or on the streets of a city. The dryness of the air probably assists their distribution by means of dust more effectually than in a more humid climate, but the general result is the same. The only point, therefore, bearing on the practical distribution of germ-life ascertained by my experiments was the unusual and absolutely sterile condition of all the air not in the immediate vicinity of human habitations. This is a most important fact. Miquel has, however, found the same absence of all germ-life at an elevation of from two thousand to four thousand metres above sea-level; while in the Rue de

Rivoli, Paris, he found fifty-five thousand bacteria in ten cubic metres.

I conclude, therefore, that there is very little proof that the actual number or kind of micro-organisms found in the average air of a city at six thousand feet has any relation to the non-development of tuberculosis, as, although the air generally is absolutely pure in our arid regions in the United States above four to six thousand feet, it is also a fact that in cities or towns at this elevation the air carries in its dust the average number of ordinary bacteria and moulds that are found in cities or towns of the same population at a lower altitude, as at the sea-level.

These experiments on ordinary bacteria in the atmosphere in Colorado Springs and near by were extended so as to include a study of the separate bacteria present. Cultures were made on potatoes, agar, and other media, and the life-history of several micro-organisms not recognized from any description obtainable was made.

The result seemed to show that the climatic influence upon the development of non-pathogermic bacteria in ordinary nutrient media was negative; that dust taken from the atmosphere outdoors and in carried with it the usual number of ordinary bacteria and moulds that are found under similar conditions at lower altitude, combined with greater humidity; while the air removed from buildings or roads was absolutely sterile.

The next point taken up was the effect of sunlight combined with a minimum humidity upon the vitality of tubercular bacilli in sputa.

It seemed reasonable to suppose that sputum, although it would become dry more rapidly in dry air, and so prove a source of danger with less delay than under more humid conditions of the atmosphere, might also more rapidly lose its virulence exposed in a climate where the average hours of sunshine are considerably in excess of those of most climates, and the diathermancy of the air or its thinness contributing to the power of the sun's rays acts as a germicide.

First having established the fact that fresh tubercular sputa injected into rabbits (either into the vein of the ear or the lower abdomen) produced a general tuberculosis within twenty or thirty days, quite as has been found under all climatic conditions, I selected the sputa which I had found contained tubercular bacilli, and from a patient, if possible, whose sputa had proved to be virulent at some previous time. This sputum was exposed to the direct rays of the sun for varying periods and at different situations, with a background of sandstone, or wood. After the exposure to the sun the sputa was rubbed up with sterilized water and inoculated into the thigh of a guinea-pig.

The animal was killed in from thirty to forty days after the time of inoculation. Some thirteen guinea-pigs were inoculated with 0.3 c.c. of sputa and water. The sputum was exposed to direct sunlight for from one hour and three-quarters to twelve hours. It was found that it took more time to dry the sputa in any quantity than was anticipated, and that, even when dried, the mass was so firm that the current of air from a blow-pipe failed to detach even minute quantities; so that without in some way grinding up the sputa when dried, as is done by wheels or soles of shoes, it really could not be said to be dangerous and capable of infection. The result, however, seemed to show that sputum so dried in the sun at six thousand feet altitude was quite as capable of giving local or general tuberculosis as elsewhere, at least, taken, as I took it, from a mass of at least two drachms and not distributed in dust as it is inhaled. The tables show clearly the details and technique of my work, but show nothing more significant than I have stated regarding the effect of sunlight upon tubercular sputum.

The infectiousness of dust, such as exists in rooms occupied by tubercular patients, was now investigated. In each case at least a quarter to half a square yard of dust was taken by means of cotton swabs from backs of pictures and dark corners, and was suspended in sterille water; it was then inoculated into the thigh of a guinea-pig, 2 c.c. being used

at each injection. As the largest hotel in Colorado Springs is more or less filled with invalids suffering from consumption, and as tourists and others in good health also frequently pass some time there in rooms that have been occupied, it was deemed of importance to determine, if possible, the infectiousness of dust from its rooms and halls. Eight guinea-pigs, therefore, were inoculated with dust taken from the halls of the hotel and walls of rooms occupied for several years. Of these eight guinea-pigs none developed any tubercular lesions, local or general. The pigs died, respectively, on the ninth and tenth day after inoculation, and might have developed tuberculosis, but, as all their organs and glands were perfectly healthy, and showed no evidence after careful search for tuberculosis, it is doubtful.

These guinea-pigs were freshly imported from Ohio, and were inoculated within seven days after arrival in Colorado, allowing no time for them to become acclimated; and in this sense they represented travellers or tourists, and not natives, whose immunity might possibly be due to prolonged residence at an altitude. The animals were kept in separate cages in a room twelve feet by six, where only a limited amount of sunshine ever penetrated, and the air-space was also insufficient to make the experiment as severe as possible. In fact, my loss from this cause was a serious drawback to my work, and the pigs lost on an average one-half ounce in weight in forty days. The animals were killed after the thirty-seventh day, this being the time deemed sufficient for infection, as it had been found that animals inoculated with dried tubercular sputum and dust showed clear evidence of general tuberculosis, as a rule, earlier than reports from experiments of like nature at a lower altitude indicated.

The non-infection of the dust was, no doubt, partially due to the general cleanliness observed, as after a room is vacated it is most carefully cleansed, fumigated, carpets taken up, etc. At the same time the personal habits of the occupant suffering from pulmonary tuberculosis, in regard to his disposal of sputum expectorated was in no way controlled, and was often,

doubtless, careless in the extreme; and under the conditions present (judging from similar experiments made at lower altitude) some of the guinea-pigs should have developed tuberculosis. Hance, to be sure, only lost five pigs out of eighty-one inoculated from dust taken from buildings of the Adirondack Cottage Sanitarium; but in these buildings efforts are directed with great care toward a prompt disinfection of all sputa—a condition unknown in the occupied rooms examined by me—whose occupants were under no restrictions as to the care of the expectorated matter, ventilation, etc.

I also obtained dust from walls of rooms in a sanitarium filled with consumptive patients. Three of the rooms were occupied at the time by patients in the third stage of phthisis, who had to use cloths to receive their sputa. Dust was also taken from the general sitting-room occupied by several patients all day. Four guinea-pigs were inoculated. One died on the twentieth day; no evidence of tuberculosis was found. The others were killed on the thirty-seventh day, and were free from the disease. This result was only to be expected, as the very greatest care is exercised in this institution to insure a safe disposal of all tubercular sputa. Sanitary cuspidors are used and burned, and strict rules against expectorating anywhere else are rigorously enforced, except in the case of those bed-ridden, who use cheese-cloth, as mentioned.

The next experiment was to determine, if possible, how readily a guinea-pig could be infected through the air alone by dried sputa. Four guinea-pigs were confined in a cage, the sunlight, air-space, and ventilation of which resembled, in proportion to the weight, as nearly as was possible, a room or rooms occupied by a consumptive patient in the city. Cheese-cloth rags were then washed in tubercular sputum of a known virulence and hung about, so as to infect the air when dried, although not to come actually in contact with the animals. Unfortunately, these guinea-pigs all died from some unknown cause, too soon to make this test of value, and I shall repeat it.

In these experiments I have, it is true, been obliged to con-

fine myself to so few animals as to preclude the possibility of any percentages being made, but it is only fair to state that the technique was conducted with great care, and in the case of dust taken from the hotel and sanitarium twelve guinea-pigs inoculated showed no trace of tubercular or septic infection. The control-animals inoculated with sputa or with sputa and dust, with hardly an exception, developed local or general tuberculosis. I did not reinoculate any nutrient media to determine whether the lesions were produced by dead or local tubercular bacilli, but all nodules were examined microscopically, and the evidence of actual tuberculosis was most convincing.

This opinion is not entirely based upon the report given. Some two years ago I inoculated in all fifty-eight rabbits with dust from twelve private houses, three hotels, two hospitals, and some public buildings, using as control experiments pure culture mixed with dust. I was so unfortunate as to lose practically the result of this work, as the brass tags on the rabbits were all changed by my assistant; also some rabbits were eaten by dogs, and some escaped. But enough data of a general character were obtained to prove, at least, the rarity of tubercular infection from any dust collected in houses, hospitals, etc., in Colorado Springs; also the infrequency of acute septic infection after inoculation with such dust—a fact I had seen strikingly illustrated in a surgical practice of some five years, in what was then the frontier of Colorado, far from any aseptic aids.

In taking dust from a general hospital in Colorado Springs, where there were many surgical cases in public wards, I did not lose 2 per cent. of my rabbits from septic infection. Cornot lost fifty-four guinea-pigs out of ninety-four by acute infection from dust from hospitals. Hance lost $35\frac{5}{10}$ per cent. of them from acute infection after they were inoculated with dust from tubercular wards of a hospital in New York; and he points out the significant facts that mixed infection is so serious that a simple tuberculosis can be changed to a mixed infection in an atmosphere laden with infective

germs, and that out of 543 guinea-pigs inoculated with dust 316, or 38 per cent., died of some septic disease developed by germs contained in the dust. In my experiments, out of fifty-eight rabbits inoculated with dust from hospitals and like places where ill people were collected, I lost but two animals from acute septic infection. Rabbits are probably less likely to develop infection than guinea-pigs; but of twelve guinea-pigs inoculated with dust from hotels and sanitariums none died of septic infection.

The question was brought very forcibly to my mind, from the results of my work in this direction, as to whether we do not owe much of the improvement in tubercular cases in Colorado to the absence of the septic germs in the atmosphere, indoor as well as out, quite apart from any climatic effect upon the tubercular germ pure and simple. This, of course, could only be determined absolutely by a much more extended series of experiments than I have taken. The important point, after all, and the most practical one, is how dangerous is it to live in Colorado Springs among consumptives? Are there any data to show the actual presence of cases that date their tubercular invasion to in some way contracting the disease by living in proximity to consumptives, as most well people do in Colorado Springs? In 1892 I published in the *American Journal of the Medical Sciences* all cases of non-imported consumption that I could find. At that time I personally interviewed every physician in Colorado Springs, and wrote to many who had lived there, besides obtaining testimony from each and every one I could in regard to the origin of consumption in the city. After two years I found and published a list, with their histories, of ten cases that had occurred in Colorado Springs during fifteen years.

Since that time, or from 1892 to April of this year, I have been collecting statistics. A circular letter was sent to every reputable physician practising in Colorado Springs, asking for a list of his cases of non-imported phthisis seen or heard of during his practice, and the number of years he has practised in the city. The number of years' practise represented

was one hundred and forty-four and a half; twenty cases were reported, including the ten reported by me in 1892. At any average city at the sea-level the rate of three deaths per thousand is acknowledged to be the average. At the same ratio a city like Colorado Springs would have had in twenty years, with its constantly increasing population, from one thousand up to twenty thousand—a total rate of six hundred and thirty deaths; while it had in twenty years ten deaths (as not all the cases reported died). In 1896 but one case was reported to the city physician. The average town at a lower altitude with twenty thousand inhabitants would show sixty deaths from tuberculosis, presumably contracted there.

The objection that in Colorado Springs statistics, based on a constantly changing population, are inaccurate does not hold. Colorado Springs, unlike most health resorts, has a permanent population. People who live there make the place their home, winter and summer, and have done so for years; many of them are engaged in indoor occupations and business life generally, quite as in any city, the proportion of tuberculous to non-tuberculous inhabitants being one invalid to every six people. Many of the inhabitanst are predisposed to contagion by family history, having come to Colorado on account of consumption in some member of the family. The tubercular and non-tubercular mingle together in a most promiscuous manner; yet, in spite of these conditions which have gone on for years, the actual rate of death from non-imported tuberculosis is so far below the rate in any average city in the United States as to make Colorado Springs, as a matter of fact, probably the least dangerous place to live in, judged from the non-imported tubercular death-rate about which we have any information.

Of the cases of non-imported consumption that did occur in Colorado Springs one only could be traced clearly to infection. In this case a robust man in the prime of life, who had lived in Colorado for eighteen years, occupied a tent with a man very ill of consumption. This patient expectorated very frequently on the dusty floor of the tent, and

the result was a very clear case of infection, as his companion inside of four months developed a cough and pulmonary hemorrhages with bacilli in sputa, although an unusually strong and athletic man. His subsequent history was a decided improvement in El Paso, Texas, to which place I ordered him to go. There was a gain of forty-two pounds in weight, but then he began to lose weight, much as he did in Colorado, and on his return to Colorado he died of tubercular laryngitis.

In all other cases there was no direct evidence of infection, but, on the contrary, those developing consumption, as far as could be observed, were far less exposed to infection than even the average inhabitant of Colorado Springs; and some of the cases lived far removed from any consumption or possible source of contagion, as on isolated ranches. Family history and childbirth were far more frequently the apparent predisposing cause; occupation was quite a negative factor. All were under the best conditions as regards nutriment, and no syphilis or exposure to weather could be traced. In two cases overexertion seemed to play an important part in inducing hemorrhages; and in one case a fall from a horse had a like effect. The general result was fatal. The disease ran a more rapid course than the average case of consumption; some 80 per cent. died at the end of the second year from the time the first symptom of the disease was observed. Pulmonary hemorrhage was no more frequent in these cases than in cases contracting the disease elsewhere. The sputa showed very much the same characteristics as observed in cases that were imported; tubercular bacilli averaged in number and shape the same; there was no more and no less elastic tissue, and streptococci with ordinary micro-organisms showed nothing unusual due to climatic influences. I regret that no blood-tests were made as to specific gravity, etc.

In regard, therefore, to infection, the fact that so many consumptives are brought into such close contact with well people in Colorado Springs seems, no doubt, a clear evidence that a risk in proportion to the exposure must logically re-

sult. Theoretically considered, such an opinion, based on well-known laws and statistics of other cities, would be safe to follow, other things being equal; but other things are not equal. A factor of six thousand feet altitude comes in, and, as I shall show, not theoretically but practically from statistics, this six thousand feet exerts a very strong and important action in limiting the extension of tuberculosis in Colorado Springs. This is also not an isolated instance. Colorado Springs is not alone in having such a low record. The low mortality from non-imported consumption contracted in Colorado Springs has its counterpart in other cities in this elevated dry belt. Even Denver, a city of 150,000 inhabitants, with tall buildings shutting out the sunlight, industrial occupations which are so conducive to tubercular increase, and, in addition, a large proportion of consumptive invalids scattered among its other inhabitants, had, as shown by the reports, only sixty-four deaths from non-imported consumption (less than half a death to the thousand) in 1896. The average city would show four hundred and fifty deaths per year to 150,000 inhabitants, without the climatic factor possessed by Denver. I sent out in April fifty circular letters to doctors in Utah, Arizona, Wyoming, New Mexico, and Colorado, asking the number of cases seen or heard of by them, and the number of years each had practised in his present locality. In this way I took in fairly well the dry belt, some of which was at one thousand feet altitude only. The result from answers received was two hundred and three years' observation in practice and one hundred and thirty cases of non-imported phthisis reported—fully 80 per cent. of which were either from Salt Lake City, in native Mexicans in New Mexico, or in an altitude below three thousand feet. This compares well with results observed in other parts of the world. Hirsh, in quoting Corbal, states that in the Grand Duchy of Baden phthisis increases in a regular ratio to the increase of population, due to overcrowding, but probably more especially to indoor occupations taking the place of outdoor or agricultural ones. It was also found that phthisis diminished in a regular ratio as the altitude increased, so that my results show merely

what has been observed before, with the exception that a town being filled with phthisical invalids did not seem to affect the result in the slightest degree. So far as I could judge, the factors of bad nutrition, overcrowding, indoor occupations, and low altitude contributed the main factors toward the phthisical increase of climate, the effects of which are to confer an immunity from tubercular infection as a rule. The point of interest now comes up as to what factor in this dry, elevated climate confers to such a great degree immunity from tubercular infection. As has been shown, in very many respects the sanitary environment of people in such cities as Colorado Springs and Denver closely resembles that of the inhabitants of any average city in the United States. A constant population has lived for years occupied in indoor occupations—a population much more exposed to contagion from dried sputa in the atmosphere than any average city, as the tuberculous invalids are so markedly in excess; and then many are predisposed by family history to the disease, so that if other things were equal it would be only logical to infer that a very large death-rate from non-imported consumption should occur. The reason that it is not so and that the death-rate is so low compared with that of other cities must be in some climatic influence. The climatic influence that favors recovery from consumption is, no doubt, composed of many factors. Very briefly, they can be stated as follows: The tubercular germ distributed as dust is much more likely to lose its virulence exposed in a climate where the sunshine is so constantly present and the air is so thin. The air-cells of the average lungs are more used, are more brought into healthy action at an altitude of six thousand feet. The increase, as told by the spirometer and by the chest measurements, is very marked in new comers to the dry, elevated climate; and it follows that organs so exercised, both by increased ventilation and by increased blood-supply, do not so readily become a suitable medium for the growth of tubercular bacilli.

The blood itself is markedly changed at six thousand feet altitude. It has been shown by Egger and Paul Bert, in the

Andes; Muntz, Vicault, Koeppe, and Woolif, in Europe, that the blood in individuals living at six thousand feet and upward above the sea is increased in specific gravity with also an increased number of red corpuscles and an increase of hæmoglobin, giving the blood greater power to absorb oxygen; and, with all this, also an increased muscular power of the heart, thus insuring to the blood in several ways an increased germicidal power, and what is probably more important, a stimulation to tissue change—all of these conditions of the blood being antagonistic to tubercular infection.

The tonic effect of altitude and cold nights is, too, a stimulant of decided value to the nervous system, much as strychnine acts by increasing the appetite, etc. There is also the dryness to be considered, the absence of moisture in the air itself being well known at any altitude, the dryness of the soil propably being the more important of the two. Bowditch, Buchanan, Pepper, Elliot, all have shown that the relation between damp soil and phthisis is a constant one; and, no doubt, some subtle influence exists by which our dry regions, such as Colorado, etc., with sandy and gravelly soil exerts an effect on the extension of tuberculosis.

Then, also, as it is now known that tubercular infection frequently arises from milk or the meat of tuberculous cattle that danger is now reduced to a minimum in Colorado and like climates. I will quote from an article of mine published elsewhere: "These facts are not confined to mankind. A general immunity, from living in this country, is also found in domestic cattle. In dairy herds, where general environment, character of food, shelter, and all conditions bearing on general health are far more likely to be the same in any climate than those of man, we have the same results, viz., that consumption in the native cattle of Colorado is a most infrequent occurrence. Careful reports show that all through a large part of the United States cattle are sacrificed to this plague of tuberculosis, or consumption, and the opinion is gaining ground that milk taken from cows so diseased and used for food is, in a large measure, responsible for many cases of consumption occurring in mankind. Reports show

that some 25 to 50 per cent. of the cattle of humid and non-elevated States are tuberculous. The reports of the State veterinarian for Colorado show only 2 per cent. in our herds (when the tuberculin-test has been made). I am assured that it is so rare a disease among Colorado cows that it is almost a curiosity; and when it does occur it is usually either in animals that have had the worst of care as regards overcrowding or in imported animals. Native cattle are nearly exempt. The testimony from all over our high, dry plateau, at from five to eight thousand feet altitude, is the same. So, if it is true that consumption is very often contracted by drinking milk from consumptive or tuberculous cows, the fact of Colorado's cattle being so remarkably exempt from this disease only adds another factor to our safety. If only two cows to the hundred have consumption in Colorado, and twenty-five to fifty to the hundred have consumption in the East and elsewhere, there is not much room for doubt as to the comparative danger from milk infection. In a drink of milk taken in any of our average cities below two thousand feet altitude we run about 30 per cent. more risk of taking consumption than we do from a glass of milk in Colorado."

An interesting question is, Will such an immunity as exists, for example, at Colorado Springs remain constant? I think that it will for the following reasons: We know that as regards indoor occupation, contact with tuberculous invalids and lack of sanitary precautions, the maximum danger has about been reached. For some years past all these factors have had full opportunity to exert their baneful influence, and the results show for 1896 no increase in non-imported consumption; and in the future, although it is true the city may become more crowded, this fact or danger will be clearly met and defeated by the sanitary precautions enforced, as a law passed in 1897 fines anyone from one to five dollars for expectorating on the sidewalks; and the sanitary condition of the city will be constantly improved to such a degree that it is safe to predict we can not only keep our present low percentage of infection from tuberculosis, but will even lower it in the future.

Experiments to Determine the Effect of Sunlight upon Tubercular Sputum.

Animals used, guinca-pigs. Seat of inoculation, left thigh.

Number of animals inoculated with exposed sputum.	Length of exposure.	Number of animals inoculated with non-exposed sputum.	Of which died within 20 days with		Of which died, or were killed, after 30 days, having			
			Local tuberculosis.	Other diseases.	General tuberculosis.	Glands generally and spleen affected.	Glands or abscess local.	Other diseases.
1	1¾ hours.	...	...	...	1			
4	2 h. 5 min.	...	2	1	...	1		
2	24 hours.	...	2					
...	.....	6	1	3	1	...	1	

Experiments with Dust from Hotel and Sanitarium.

Animals inoculated with dust from				Number died on 9th or 10th day.	Number died on 20th day.	Number died on 36th day.	Number killed between 36th and 40th day.	Number showing any tubercular affection.	Number died of other causes.	Number square yards dust used.
Halls of hotel.	Sleeping-rooms of hotel.	Sitting-rooms of sanitarium.	Sleeping-rooms of sanitarium.							
5	...	...	...	...	...	...	5	...	...	½ sq. yard.
...	3	...	...	2	...	...	1	...	2	½ sq. yard.
...	...	1	...	...	...	1	...	...	1	1 sq. yard.
...	...	...	3	...	1	...	2	...	...	1 sq. yard.

Date.	Experiment number.	Quantity of sterile water used to dilute dust.	Quantity of solution inoculated.	Dust taken from sanitarium or hotel.	Occupancy of rooms by phthisical patient.	Number of bacilli found in sputum of occupant.	Stage of disease patient suffering with.	Sq. yards of dust used.	Number of days animals lived after inoculation.	Extent of tubercular affection.	Died of other diseases.	Number of days animals had lived in Colorado.
1897 March 4	1	2½ c.c.	2 c.c.	Hotel.	Halls.	.....	.....	½ sq. yd.	Killed 36 dys.	Negative.	.....	7 days.
" 4	2	"	"	"	"	.....	.....	" "	" 37 "	"	.....	7 "
" 4	3	"	"	"	"	.....	.....	" "	" 37 "	"	.....	7 "
" 4	5	"	"	"	"	.....	.....	" "	" 38 "	"	.....	7 "
" 4	6	"	"	"	"	.....	.....	" "	" 40 "	"	.....	7 "
" 4	7	"	"	Hotel rooms.	4 months.	.....	.....	" "	Died 9 "	"	Intestin'l cause.	7 "
" 4	8	"	"	Hotel rooms.	"	.....	.....	" "	" 10 "	"	Intestin'l cause.	7 "
" 4	48	"	"	Hotel rooms.	"	.....	.....	" "	Killed 40 "	"	.....	7 "
" 3	24	2 c.c.	"	Sanitarium	Sitting-room.	.....	.....	" "	Died 36 "	"	Exposure	6 "
" 3	25	"	"	Sleeping-rooms, sanitarium.	4 months.	2-3 in field	Third.	1 sq. yd.	Killed 37 "	"	...	6 "
" 3	26	"	"	2 sleeping-rooms, sanitarium.	4 months. 3 weeks.	2-3 in field 10-15 "	Second. Second.	½ sq yd. " "	Died 20 "	"	Unkn'wn	6 "
" 3	27	"	"	Sleeping-room, sanitarium.	6 months.	1 or 2 to field.	Second.	" "	Killed 40 "	"	...	6 "

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DISCUSSION.

Dr. Fisk took the chair, upon being asked by the President to do so.

Dr. Bowditch: In connection with the interesting paper which we have listened to, I wish to speak of certain incidents which have lately happened in Boston of more than local interest.

Most of our medical men there have been surprised and disgusted by attempts which have lately been made among real-estate holders to abolish two homes for consumptives in the immediate suburbs, on the ground that they were a source of great danger to the surrounding community. The city government and State Legislature have both witnessed some of the most extraordinary scenes and heard the most ridiculously extravagant statements made in defence of a bill introduced nominally to prevent the erection of hospitals for any contagious disease whatever. The real object of the bill, however, was to abolish the two hospitals for consumptives.

I regret to say that two medical men of high repute lent their names to a "manifesto" in support of the bill, by which action they sanctioned statements which cannot be proved by facts.

The evidence given us by the great sanitaria of Goerbersdorf and Falkenstein, and the Brompton Hospital in London, is sufficient to refute such extravagant and ridiculous statements; on the contrary, they prove that properly-regulated hospitals for consumptives, even in crowded districts, are a *benefit* to the community at large, because patients are controlled and taught methods of cleanliness and decency.

Apropos to this, Dr. Gardiner's paper was particularly interesting to me, especially the point regarding the effect of sunlight upon the bacillus. It seems to me that the practical bearing of such experiments is great, and I wonder that the bacteriologists do not experiment more in this direction to either confirm or refute statements made by such men as Delapine and Ransome, who state that after a few hours' exposure to sunlight the bacilli become inert. If this is true, what a vast difference it makes in our attitude about the danger from sputa when exposed to sunlight. I am very glad that Dr. Hance is experimenting in this direction, and that we shall hear more from him next year.

Dr. Hance: What Dr. Bowditch has said upon Dr. Gardiner's paper I thoroughly indorse. I myself have been making some investigations in the same direction, and, in its results, my work was a great contrast to that of Dr. Gardiner. I examined three rooms that were occupied by a large family, and obtained ten square inches of dust from the room occupied by the mother, with which I inoculated

some guinea-pigs. Of the four inoculated pigs, three died of tuberculosis and one of an acute infection.

In contrast to Dr. Gardiner's results concerning the purity of the air, I examined the dust in the Broadway cable cars, elevated cars, and the Avenue C and Houston Street surface cars in New York City. In the cable cars I found a greater number of germs than in any cars in that city. The test is not a satisfactory one, as it was merely a comparison of the number of colonies which grew on gelatine plates after an exposure of five minutes. I agree with Dr. Babcock upon the inadvisability of the use of atropine. For years I have found guaiacol of considerable value. Dr. Solis-Cohen said that he got good results from its application, but he used very large doses. I apply it to the skin in 15 to 30 drop doses three hours before the fever usually comes on. This I continue for several days, unless it acts as too severe a depressant.

Dr. Curtin: I was delighted to hear Dr. Solly speak against the too free use of alcohol in tuberculosis. The order too frequently given in these cases is, "drink whiskey freely."

Dr. Babcock spoke of the ulceration of the intestines and diarrhœa as a symptom of pulmonary phthisis; but my experience has been that ulceration of the intestines is very rare. In the Philadelphia Hospital I have examined many cases that seemed, during life, to have this ulceration, but found on autopsy that none really existed. Many cases of pulmonary tuberculosis have diarrhœa caused by acid or other dyspepsias, brought on I fear by improper feeding and treatment.

Dr. Gardiner: In regard to the sterile condition of the air in Colorado, I wish to say that I used a far more severe test than that spoken of by Dr. Hance, or drawing the air through filters of sterile sugar in glass tubes; and even when I used this test, drawing as much as ten cubic metres of air at one time, the results showed a perfectly sterile air when not near buildings or camps. Perhaps Dr. Hance tried both of these methods that I used. I found a great many germs in the air over upper berths of railroad sleeping-cars, where they were occupied, and also in the air of closely-crowded rooms.

OBSERVATIONS UPON PULMONARY TUBERCULOSIS IN COLORADO.

By S. G. BONNEY, M.D.,
DENVER.

The object of this paper is to institute an inquiry, from a clinical standpoint as to the relation of the Colorado climate to the course of pulmonary tuberculosis.

For its proper consideration a large experience is essential, to be secured only from a prolonged residence in the State, in constant, intimate association with the disease, with ample facilities for extended investigations.

Although appreciative of the exhaustive nature of the subject, and mindful as well of my own limitations, I venture to offer the results of my experience, together with brief statistical data, in the hope that therefrom may be derived some approximately accurate and practical conclusions. It is not my intention to enter into an elaborate analysis, as I am somewhat skeptical as to its practical utility.

My opportunities for observation have been extended through a residence of five and a half years in Colorado. I present, however, a series of 200 cases seen in private practice during a period of two years. These cases have been carefully selected, subjected to continued personal supervision, and conscientiously recorded.

In order to obtain greater accuracy of conclusions an effort has been made to include only those in the list whose condition upon arrival seemed to be especially applicable to the climate and who have subsequently remained under constant observation.

No case is presented that has been observed for less than six months, nearly all, however, having been seen during a much longer period.

The diagnosis was confirmed by examination of the sputum in all cases where the physical signs did not furnish indubitable evidence of the nature of the affection. In fact, this was adopted as a routine measure in the majority of instances.

Considerable difficulty was experienced in the proper classification of the cases. Usually quite extensive infection had taken place before the arrival of the patient in Colorado. The very incipient stages were, therefore, but exceptionally observed, while far advanced cases with practically hopeless prognosis were not admitted in the list.

It may be fairly assumed, therefore, that the 200 cases form a rather distinctive class, embracing in a general way those with pronounced tubercular infection, which would have pursued an unfavorable course at home, but offered reasonable assurance of improvement in Colorado.

Further classification, made solely with reference to the stage of the disease or the extent of the process, would be, I believe, very misleading. I have preferred to make the division according to the individual prognosis at the time of arrival, the estimate of which was based upon a careful review of all the factors having a possible bearing upon the case, without exclusive reference to the area or degree of pulmonary involvement.

There are three classes, based upon relative prognosis:

Class A. Prognosis excellent. Moderate infiltration limited to one lobe or a portion of the same; evidences of moisture; no softening; pulse, appetite, and digestion good; temperament sensible. Other considerations favorable.

Class B. Prognosis fairly good. More extensive involvement of one lung or portions of both, viz.: Consolidation of one lobe, with moist râles or with possible beginning cavity-formation; partial consolidation of entire lung, with evidences of moisture; infection of both lungs, with signs of consolidation limited to apices or thereabouts.

Finally, cases that, from consideration of physical signs alone, would belong to Class A, but, owing to nervous, circulatory, or digestive disturbances, or other unfavorable circumstances would probably come under Class B.

Class C. Prognosis doubtful. Extensive active infection limited to one lung, with or without small or moderate-sized cavities. Definite invasion of both lungs, with but moderate activity of the process. Cases with somewhat less pronounced pulmonary involvement, but with considerable constitutional impairment or associated with other obviously unfavorable factors.

I am too well aware of the deficiencies of this method of classification, but have been able to adopt none other affording, upon the whole, equal satisfaction.

In describing the results obtained I make no mention of any cases as cured.

By apparent total arrestment, I allude to entire absence of moisture or of other evidences of activity of the tubercular process, complete cessation of cough or expectoration, and no apparent constitutional disturbance.

By marked improvement, I refer to an excellent general condition, frequently sufficient to justify the performance of work, but the persistence of signs of slight existing trouble, with or without morning cough or expectoration.

By improvement, I refer to a material lessening of the activity of the process as disclosed by physical signs, diminution of cough and expectoration, lowering of pulse and temperature, increase of appetite, digestion, and weight.

Of the 200 cases under consideration, forty are included in Class A, as follows:

Apparent total arrestment	21
Marked improvement	7
Improvement	8
No change	2
Dead	2

Thirty-six out of forty, or 90 per cent., have received material benefit.

Class B numbers fifty-four:

Apparent total arrestment	10
Marked improvement	21
Improvement	12
No change	5
Grown worse, or dead	6

Forty-three, or over 79 per cent., have gained in this class.

Under Class C, with a total of 106, the results are:

Apparent total arrestment	2
Marked improvement	29
Improvement	28
No change	15
Distinctly worse, or dead	32

Over 55 per cent. have improved—a large proportion, in view of the character of the cases considered in this class.

The results obtained for the entire number, without distinct reference to class, are:

Apparent total arrestment	33
Marked improvement	57
Improvement	48
No change	22
Grown worse, or dead	40

Sixty-nine per cent. of the cases have improved in Colorado. Forty-five per cent. have made very decided improvement. Sixteen and one-half per cent. have obtained complete arrestment of the tubercular process.

The significance of these figures is emphasized by the comparatively short period of observation.

It is manifestly fair to assume that a fair proportion of those classed as *much improved* will, in the course of a more prolonged period of observation, obtain ultimate complete arrestment.

In like manner it may be expected that several exhibiting moderate improvement now may subsequently be placed in the column of *decided improvement.*

There appears, however, from my own experience, but little probability, save in exceptional instances, of any very distinctive change for the better taking place in those who had failed to show improvement during one year in Colorado, if under competent medical supervision.

In justice to the climate, an important modification of these results should be explained by the effect of intercurrent disease, accident, and pronounced individual indiscretion.

Among the sixty-two cases reported as not having responded favorably to the climatic influences, eleven had previously done well, but in whom subsequent failure may be ascribed as follows:

Appendicitis, operation, death	1
Empyema, operation, death, or grown worse	2
Suicide	2
General tubercular invasion	1
Palpable imprudence	5

Should these facts be admitted in the analysis of results, it would appear from the entire data introduced that about three fourths of all the cases properly applicable to the climate may be expected to improve.

It is interesting to note that my report of general results is much in accord with that of Dr. Fisk in his elaborate analysis, in 1889, of 100 recorded cases in Colorado.

My further observations are summarized briefly as follows:

Age.	No. of cases.	Improved.	Percentage of improvement.
17 to 20	12	8	66
20 to 30	102	75	73
30 to 40	67	41	61
40 to 50	14	10	71
Over 50	5	4	80

From these figures the influence of age, within certain limts, upon the course of the disease in Colorado would seem but slight, although somewhat in opposition to the generally accepted opinions. The similarity of results at the several periods of life referred to is somewhat surprising, but is, nevertheless, offered for what it is worth as perhaps one of the anomalies of my experience:

		Number improved.	Percentage of improvement.
Males	145	100	69
Females	55	38	69
Females.		Number improved.	Percentage of improvement.
Married	21	12	57
Unmarried	34	26	76

It was noticed that a very large proportion of the males came to Colorado alone. Of the females, those who were married were almost invariably accompanied by husband or children. The unmarried females were found, with two or three exceptions, to be under thirty years of age. The practical points to be recognized from reference to the above are:

1. Notwithstanding the fact that the disease has been universally found to attain greater prevalence among the members of the female sex, yet opportunity for a possible arrestment by a change of climate is not offered to the female nearly as frequently as to the male.

2. That the percentage of improvement in females is materially greater in those who are unmarried and without family encumbrances.

3. That, despite obvious adverse conditions and contrary to established conclusions, the female in this series of cases has responded to the favorable influences of the climate equally with the male.

Lest this be regarded purely as an instance of the strange fallacies of statistics, I offer several possible explanations in support of my results.

In Colorado the question of success or failure in the effort to secure arrestment depends largely upon the ability of the individual to conform to a proper regimen of daily life, entailing for its greater perfection certain physical and mental requirements. These, I believe, are possessed to a greater extent by the female.

I cannot see that the separation from family is essentially harder for her to bear than for the male. On the contrary, she seems to adapt herself to strange conditions quite as quickly and as comfortably. While, in general, less opportunity is offered for an existence in the open air, with judicious exercise, a life of more complete rest is assured, with perhaps as many hours of sunshine. There is less chafing under restraint, less of the cares and responsibilities of life, less tendency to acts of imprudence, and, from my experience, more implicit obedience to detailed instructions.

It is but fair to add that the financial circumstances of the lady invalid in Colorado are in general relatively superior to those of the male. It is no uncommon occurrence to meet the young man with extensive tubercular infection and insufficient means who has been sent to Colorado (and usually to Denver) with instructions to secure immediate employment by which to supply his necessities. In the event of either success or failure in his effort to find work the battle is for him against great odds. As a general rule, cases with such limited resources are better at home.

The lady invalid does not usually seek change of climate unless proper provision has been made for her support.

Race. Distribution. Previous Environment.

Fifty-three, or rather more than one-quarter of the cases, occurred in those of direct foreign descent, although many were born in this country, and in most instances from the better class. It does not seem profitable to enumerate statistics relative to the several nationalities.

The fifty cases are distributed somewhat equally among the Jews, Irish, Germans, Scotch, Swedes, English, and Canadians.

The Jews, numbering eight, have almost uniformily shown more extensive pulmonary involvement upon arrival, but have exhibited apparently greater resisting power than any other race. I have been impressed with the disproportion in these people between the physical signs and the general condition. While the course of the disease has been usually prolonged, the process of arrestment, on the other hand, has been slow and disappointing. The Jew has been invariably obedient and conscientious to the last degree in following instructions.

The Irish, from my experience, have seemed to be more expecially predisposed than others. The disease has been more rapid, the process more active, with greater tendency to nervous disturbances, and the patient harder to control.

The Swedes, although apparently hardy and vigorous, have succumbed much more quickly than those of our own country. They are usually exceedingly apprehensive and easily managed.

It has been my general experience that the Germans, Scotch, English, and Canadians adapt themselves quite readily to an appropriate system of living, excelling in this respect our more restless Americans.

The latter number 147 in my series of cases, and are principally from New England and the extreme Eastern States. The list includes thirty from the Middle States, ten from the South, and, strangely, none from the region west of the Rocky Mountains.

I think it may be said that certain tendencies incident to previous surroundings and environment, are, like racial characteristics, not without some influence in modifying the course of the disease. The lighter the burden of business responsibilities, the more phlegmatic or philosophical the individual, with less of general restlessness or irritability of temperament, the better the prognosis.

Too frequently the patient comes to Colorado for a prescribed number of months. His recovery must take place in that period, as no further extension of time can be diverted from his business, which he often continues to conduct by correspondence, and meanwhile indulges occasionally in speculative investments in Colorado.

The previous occupation appears also to possess some significance. From my experience those who had previously led sedentary lives are likely to do better upon coming to Colorado, under a system of rational management, than those who have been accustomed to outdoor occupations, the obvious explanation being the opportunity permitted for greater change in the mode of life and consequent greater impression upon the course of the disease.

Inherited Predisposition. Seventy-seven of my cases present a history of previous family taint. Without entering upon an unnecessary analysis, it is of some interest to state

that in nearly one-half the cases the brothers and sisters were alone affected.

In noting final results there are singularly no distinctive differences observed relative to the source of the inheritance. The percentage of improvement for the entire number is 60, as compared with 72 per cent. for those with no apparent inherited susceptibility. May not the similarity of results possess some significance in the proper estimate of the influence of predisposing causes other than those of inheritance?

The frequent existence of definite predisposing causes among several members of the same generation in one family without history of immediate inheritance is, to my mind, strong supplementary evidence in support of the view that the relation of heredity to the etiology of the disease consists, as a rule, not in the direct transmission of the bacillus, but in the increased vulnerability of pulmonary tissue, with diminished resisting power of the individual.

The *occasional* occurrence of congenital tuberculosis is demonstrated by the detection of the bacilli in the placenta or in the organs of the newly-born, as well as by the positive results, in exceptional instances, attending inoculation in guinea-pigs from the placenta or the organs of the child, despite the failure to discover either the bacilli or the evidences of tuberculosis in the tissues.

Inasmuch, however, as negative results have frequently followed similar investigations, even where active tuberculosis existed in the mother, it is safe to say that no conclusive testimony has yet been adduced to substantiate any frequency of intrauterine infection.

Extent and Character of Pulmonary Infection.

At the time the cases came under my observation the tubercular process was limited to the right lung in fifty-nine cases, to the left in thirty-one, and with the involvement of both in 110.

The fact that more than one-half of those in my entire list

came to Colorado with pronounced signs in each lung should emphasize, I think, the necessity for earlier diagnosis and more prompt climatic treatment.

It is somewhat remarkable that the percentage of improvement for those with double infection is nearly equal to that of those with single lung invasion.

Well-defined cavities have been recognized in twenty-three cases, in thirteen of whom the improvement has been very perceptible.

The significance of these facts must be to the effect that the prognosis is dependent not alone upon the area of involvement nor the degree of tissue destruction, but as well upon the present activity of the process and upon the influence of other factors of recognized importance.

I desire to make mention of the frequency with which I have found localized areas of active infection in the mid-scapular space, with no signs elsewhere in the same lung.

I feel that this region, the importance of which is perhaps hardly appreciated, is occasionally the seat of the only active trouble existing within the chest, the same not infrequently escaping recognition. I am also led to believe that signs of incipient infection in the axilla of the apparently non-affected side are occasionally overlooked.

In the extension of the tubercular process from the right lung to the left I have several times observed the locality first infected to be the tongue-like projection of lung covering the apex of the heart, the signs extending slightly to the left before evidences could be detected of involvement elsewhere.

Mode of Onset. Thirty-eight cases were said to have been shortly preceded by *la grippe*. The history usually given was that of an acute attack of but few days' duration, attended with cough, which persisted or subsequently returned. In round numbers, 60 per cent. of these have improved in Colorado.

Thirty-two cases were associated with hemorrhage in the very early stages, this being the first intimation of existing trouble. Over 84 per cent. have made improvement.

Seventy-six cases conform to the *anæmic* type; percentage of improvement, 59. Seventeen began with symptoms of cold—82 per cent. showing an improvement.

The remaining cases either followed pleurisy, with or without effusion, pneumonia, typhoid fever, measles, or whooping-cough, statistical observations concerning which are hardly profitable.

Special attention is called to the prevalence of *la grippe* as a causal factor, with its relatively unfavorable results, the high mortality-rate attached to cases of insidious anæmic origin, and the remarkable percentage of improvement obtained in initial hemorrhagic cases. The probable explanation of the latter is found in the opportunity offered for more early diagnosis and more prompt removal to Colorado.

Relation of Climate to Cases with Hemorrhage.

Seventy-eight of my cases presented the history of one or more hemorrhages before arrival. Of these thirteen, or about 16 per cent., had recurrences subsequently. Seven were distinctly of aneurismal origin, occurring after long periods of relief and induced by obvious acts of overexertion or other indiscretion.

Of the remaining 122, eight have experienced their first hemorrhage since coming to Colorado.

With reference to the general condition, the percentage of improvement for the entire number of hemorrhagic cases is 79; for the non-hemorrhagic cases, 62 per cent.; for those with previous hemorrhage, but no recurrences in Colorado, 87 per cent.; for those with subsequent recurrences, 38 per cent.; for those with initial hemorrhage occurring after arrival, 37 per cent.

A comparison of these results would indicate broadly that hemorrhagic cases do remarkably well in Colorado—even better than the non-hemorrhagic; that the proportion of recurrences is small; that cases with recurrent hemorrhages after arrival are less favorable, and that hemorrhages be-

ginning in Colorado are attended with still more serious results.

In general, I am impressed with the restraining influence of the climate upon the tendency to repeated hemorrhages in those cases of more remote origin, but question the effect of the altitude upon those of very recent date, the very means of subsequent protection becoming at first a source of increasing danger.

Hemorrhages beginning in Colorado are apt to be severe, being in many instances of the aneurismal type.

I am not prepared to venture any clinical opinion as to the general severity or degree of shock attending hemorrhages occurring in Colorado as compared with the same at lower elevation, on account of insufficient opportunities for observation at the sea-level. My patients, however, from their own experience, have seldom been able to perceive any marked differences in this respect.

Since the compilation of these results, some two or three months ago, I have been forced to recognize the existence of a considerable number of exceedingly small hemorrhages without disastrous results among patients apparently doing well, the most of them, however, are not included in this list.

In view of the uniformily benign character, their origin is presumably incident to slight disturbances of circulation consequent to retrogressive interstitial contractions, and hence a possible indication of the favorable progress of the disease.

Functional Nervous Disturbances.

It is frequently urged that residence in high altitudes for the consumptive is contraindicated by the coexistence of certain nervous phenomena, as severe and protracted headaches, insomnia, irritability, and other neuroses. The reason adduced is the supposed aggravation of the nervous symptoms and the consequent unfavorable influence upon the course of the tubercular disease.

The inference implied is that improvement in the nervous derangement must precede any change for the better in the lungs.

These conclusions, however, are not borne out by the established facts of experience.

The observations for many years in Denver of the neurologists, Drs. Eskridge and Pershing, indicate no influence of altitude whatever upon functional nervous disorders. With this, my own experience relating to the nervous disturbances in the pulmonary invalid is in complete accord.

Fourteen of my patients included in this paper exhibited nervous symptoms to such an extent as to seriously prejudice the chances of recovery. No history could be obtained of any aggravation of the same upon coming to Colorado.

Nine have obtained partial arrestment of the process and material improvement in the general nervous condition. Two have shown no abatement of physical signs, but have made a distinct gain from the standpoint of the neurologist.

I am convinced that such results could not have been secured in the warm, moist climate with low elevation, so frequently recommended for this class of patients.

I recognize that the existence of pronounced nervous manifestations offers a serious obstacle to improvement in any climate, but regard the pulmonary infection as the paramount issue and insist upon the functional derangement as demanding greater attention to details of management rather than change of climate.

I have frequently observed improvement in neurotic as well as other cases, following change of surroundings, without the slightest difference in climatic conditions, as even from one section of Denver to another.

The psychical influence of the change appears to be the essence of the benefit produced. It has invariably been the case that improvement in the nervous symptoms has been in proportion to the degree of arrestment and the gain in the general strength.

Bronchial Irritation.

It must be admitted that this annoying condition exhibits a tendency to persist for a period or to become temporarily aggravated in Colorado. I am convinced, however, that in but exceptional cases does there exist any relation to the prognosis. The possible irritative effect of the altitude and dryness upon the bronchial mucous membrane, disagreeable though it may be, is by no means a criterion of the precise influence of the climate. The efficiency of the latter is measured solely with reference to the subsequent course of tubercular process, which is the only consideration of special importance.

The bronchial irritation presented in these cases is of minor significance, and may be assumed to be rather an expression of individual idiosyncrasies, susceptible, in nearly all instances, of decided amelioration under a proper regime.

Twenty-three of my cases suffered to a greater or less extent from a frequent, dry, useless cough, often of a paroxysmal nature, and subject to exacerbations, without apparent cause. In all these the irritative bronchial character was sufficiently defined to permit distinctive classification.

Thirteen have made decided progress toward arrestment of pulmonary disease, with a correspondingly marked diminution of the bronchial irritation.

Five are about the same with respect to the active process, but with bronchial irritation much diminished.

One is doing poorly, with bronchial irritation less. One doing poorly, with bronchial irritation not diminished. One about the same, but with bronchial irritation unchanged. Two dead.

The results obtained are certainly satisfactory, and, if possessed of any value from which to draw provisional conclusions would suggest that the presence even of a considerable degree of bronchial irritation is to the pulmonary invalid no contraindication for the Colorado climate.

Only in cases where this condition is associated with or

dependent upon extensive pathological changes involving the pulmonary or circulatory apparatus, of themselves demanding a different climate, would I consider such a course advisable.

I will add in this connection that I have not regarded the existence of simple valvular heart lesions as necessarily contradictory to high altitudes for the consumptive. Aside from gross degenerative changes or dilatation, I believe that the question of residence for the consumptive with cardiac complication must be settled solely with reference to the relation estimated to exist between the demands for work upon the heart and its power to respond to the same.

Fever.

There is perhaps no single feature, in the final estimate of the prognosis, of greater importance than the temperature, as denoting the degree of activity of the process and the measure of individual resistance.

Cases presenting the fever of septic absorption are not included in this list, the most of my cases conforming to the intermittent type of tuberculization or ulceration.

Sixty-eight, upon arrival, exhibited daily in the afternoon a temperature of 100.5° or over. Fifty-five per cent. of these have gained very perceptibly.

From my general observation I do not incline to the opinion that fever is increased in Colorado or that pyrexia, in itself (other conditions permitting), is a contraindication for high altitudes.

Complications.

Among the various complications simple mention is made, without reference to statistics, of the occasional development of empyema, pneumothorax, fistula, syphilis, sarcoma, purpura hemorrhagica, acute rheumatism, typhoid fever, and tubercular involvement of the brain, glands, intestines, bones, and epididymis.

In six cases the tubercular process developed in patients

who had been subject for some years to genuine asthma. These have all done well in Colorado. I do not refer, of course, to the dyspnœa of symptomatic asthma dependent upon pronounced pathological changes.

There is one complication, however, of special interest and worthy of more extended notice—*tubercular laryngitis.*

Twenty-one of my patients have suffered from this condition. Six have shown general and local improvement. Ten have grown worse. Five have died.

In ten the disease existed before arrival. Four of these have done well. Six have died or grown worse.

In eleven the laryngeal involvement developed in Colorado. Of this number, however, seven presented no evidence of the disease until a few weeks before death from pulmonary involvement.

Of the remaining four, who may be fairly said to have developed the disease in Colorado, two have improved in every way.

These results do not suggest any deleterious effects of the climate with reference to the development or the course of laryngeal tuberculosis. In fact, with local treatment improvement in this respect is largely commensurate with the gain in the general condition.

The existence of tubercular laryngeal involvement, and especially if not confined to the interior of the larynx, is a serious complication in any climate.

Management.

Without enumeration of details, I may state that none but the more rational and conservative measures of treatment have been employed. In no instance has use been made of tuberculin anti-phthisin or nuclein injections, inhalations of any kind, the various forms of breathing appliances, or other special methods of treatment, with their modifications.

The general essentials recognized have been an inactive life in the open air during as many hours as possible in the day-

time; the maximum amount of proper nourishment, contentment of mind, attention to digestive and other disturbances, as they arise; strict regard to the minor details of daily life, with occasional admonitions, frequent reassurances, but constant vigilance.

The patients have been uniformily instructed, as far as practicable, concerning the true significance of their condition, in the hope of appealing directly to their own intelligence and securing their more active co-operation. The ability to direct the management successfully is largely in proportion to the degree of personal influence—a factor of the utmost importance.

An effort has been made to recommend, from personal knowledge, suitable accommodations providing proper conditions for the individual case.

I have preferred a residence in the higher and more thinly settled portions of the city or neighboring ranches, and during the summer time removal to the mountains. The latter is usually of decided benefit.

A large proportion of the reported cases spent the summer of 1896 at the same mountain resort, thus admitting closer medical supervision than if widely scattered, and with altogether more satisfactory results.

Strychnine has been of chief importance in my medicinal therapeutics, together with nutrients, creosote to a moderate extent, and rational measures looking to the relief of cough, as well as digestive, circulatory, and nervous disturbances.

No matter how complete the arrestment, I have never approved of a permanent return to the previous conditions of climate or general surroundings.

The increased expansion with vesicle dilatation, resulting from a somewhat extended residence in elevated regions, is no argument against the selection of Colorado as a health resort, but does constitute one of the strongest objections against a subsequent return.

I will submit for your acceptance my conclusions, viz.:

That climate offers to the pulmonary invalid greater assurance of improvement than can be otherwise obtained.

That the meteorological conditions along the Eastern Rocky Mountain slope are especially applicable for this purpose.

That throughout this region portions of Colorado surpass other localities by virtue of her immensely superior accommodations, her increased social advantages, and, later on, her favorable business opportunities.

That a greater number may be expected to acquire ultimate permanent arrestment or at least secure material improvement in this State than elsewhere.

That residence in Colorado at an elevation of from 5000 to 7000 feet is indicated for the large majority of cases, without special reference to age, sex, race, or family predisposition.

That functional nervous derangements, bronchial irritation, pyrexia, moderate-sized cavities, tubercular laryngitis, and valvular cardiac lesions are not of themselves contraindications to the high altitude.

That hemorrhagic cases, within limits previously mentioned, are peculiarly appropriate for the Colorado climate.

Broadly speaking, that the only cases unsuited for residence in this State are those with very extensive infection, considerable destruction of pulmonary tissue, enfeebled cardiac power, well-marked sepsis, or exhausted finances.

That the benefit derived is dependent not upon climate alone, but as well upon the conscientious attention to mode of life and management.

That for the successful management conservative, rational measures are essential, to the exclusion of the special methods.

Finally, the cases should come early and come to stay.

THE COMPARATIVE MERITS OF RESORTS IN NEW MEXICO, COLORADO, AND ARIZONA.

By S. E. SOLLY, M.D.,
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[Dr. Solly, before reading his paper, said it was sad to think how often fashion or caprice influenced the doctor's choice of a climate, and one was tempted to misquote Shakspeare to the extent of exclaiming, "See what an ill (in)formed thing this said fashion is!" or to recall the story told of a distinguished consultant that a patient once called to see. The servant who answered the door inquired if it was a matter of great importance for the patient to see the doctor, as he was much engaged. "No," said the patient, "I only wished to know whether he would recommend me to go to Aix la Chapelle." "I can tell you that he would not, because this is his Aix les Bains day."]

We all have heard the saying of Mrs. Malaprop, "Comparisons are odorous," and I trust I may not be forced to exclaim with Hamlet's uncle, "My offence is rank; it stinks to heaven!" but rather may rest with a quiet conscience, having presented you with comparisons redolent of reason and fragrant with facts.

Of the resorts to be considered, the most northern (Estes Park) is parallel with Philadelphia, while the most southern (El Paso) is on a line with Atlanta, Ga. El Paso lies in Texas, just beyond the borders of New Mexico, but climatically it belongs to New Mexico rather than to Texas, and is, therefore, so considered in this paper. It is obviously impossible to make mention of all the places in this section of the country which are

used as health-resorts. Reference is made only to those which are most characteristic, or to those of which the meteorological data are fullest. In the appended tables I have recorded the substance of all the weather-reports obtainable; yet there is much desirable information that at the present time is not forthcoming, and, therefore, these studies are so far incomplete. The statements made will be found to be based upon the facts given in the tables and upon the references quoted.

Before proceeding to discuss the differences between these resorts it will, perhaps, be well first to consider in what respects they are similar. Owing to their great distance from the ocean and their relation to the main mountain-ranges of the continent, the climate of these States is everywhere extremely dry, with brilliant sunlight and with usually high solar and relatively, and, indeed, on the high ground, actually, low shade-temperatures; the nights are cool, and the days warm, quite beyond anything experienced in any other climate at present available for invalids.

The annual means range as follows: Relative humidity from 50 per cent. to 42 per cent.; absolute humidity between 1.79 grains and 3.25 grains per cubic foot of air; rainfall from 7 to 16 inches; the number of cloudy days from 30 to 57, and the temperature from 40° at Estes Park to 72° at Yuma; the elevations vary from 7200 feet at Estes Park to 140 feet at Yuma. The latitude extends from 40 to 33. The annual wind movement ranges from 6663 to 3379 miles.

When we come to consider the differences between the climates of these resorts, upon looking at the appended tables it will be noticed that the chief points of distinction are in temperature, wind-movement, latitude, and elevation. A comparison between the temperatures of places of similar elevations shows that latitude does not exert as great an influence as altitude. And, in comparing resorts of different elevations, it will be seen that altitude is all-important in modifying temperature and, in a less degree, wind-velocity. For these reasons it would appear that the best method of arranging these resorts for purpose of comparison is in the order of their altitudes.

As this country lies more or less under the lee of the Rockies it is necessarily dry. In Colorado the bulk of the precipitation occurs in the last two months of the spring and of the summer, while in New Mexico and in Arizona the spring is much dryer, and the rainfall, which is usually less in amount, occurs both in the winter and in the summer. In all the resorts the autumn weather is about equally dry, bright, and of a pleasant temperature. In all of them the winter weather is good, being, however, somewhat more severe as the more northern latitudes are approached. The springs are dryer, pleasanter, and less stormy in the southern half of New Mexico and of Arizona than in Colorado and in Northern New Mexico.

In Colorado and Northern New Mexico the summer weather in places above 5000 feet is cool and moderately dry, and very pleasant, healthy weather for the visitor and invalid. In Southern New Mexico and Arizona, except at elevations of 7000 feet and more, the excessive dry heat is very trying to all but the robust, and there are only a few invalids whose health is improved by these extreme conditions. A glance at the column showing the night temperatures emphasizes the difficulties to the invalid of the summer climate in the lower and southern resorts of this region. The dust, which is generally more abundant and irritating on the lower ground of New Mexico and of Arizona at all seasons, is especially so in the summer.

In most of the reports of the health-resorts the character of the soil is not detailed, but inquiry reveals the fact that in many of the resorts, especially on the lower ground of Arizona, the soil is mainly adobe, the towns being built in the river-valleys, so that a great deal of fine alkaline dust arises from the ground in hot, dry weather, while rain or snow will lie upon the surface in cups and hollows for many days longer than it does upon the sandy or gravelly slopes or benches which are generally found situated above the river-bottoms; and it is very obvious that the local conditions of these resorts for the most part are very inferior. The majority of the town-sites have

been chosen for convenience to water rather than for reasons of health, and the difference in the hygiene of a town situated upon a hillside or mesa to one on a river-bottom is perfectly astonishing, so that it may be said that the environment of many of these resorts is very unworthy of their climates.

What has been said about the town-sites is equally true of the accommodations. Most of the towns have not been built for, nor do they cater to, the delicate or fastidious invalid. The lack of interest and amusement or occupation is also a serious drawback in many of these places. And in considering the powerful influences of mind over body, it is most true of the majority of invalids, especially of the consumptive, that

> "Absence of occupation is not rest,
> A mind that's empty is a mind distressed."

Before proceeding to give the specific information about the different resorts, it is perhaps well to discuss briefly what is known or believed to be true of the general effects upon health or disease of the chief factors of climate. And as phthisis is the most common and most important of the diseases for amelioration of which these climates are sought, we shall consider the matter from this point of view. As a broad general statement it may be said that consumption is most prevalent in proportion to the temperature and the humidity of the climate. First, in damp, cold climates; second, damp, hot climates; third, dry, hot climates; and, fourth, dry, cold climates, while in curative effects it is true in the reverse order. This indicates that in a general way dryness is of benefit, and humidity obnoxious to phthisis, while the relative effects of heat and cold depend upon the degree of dampness. Heat in a damp climate, except when tropical, is less harmful than cold, while heat in a dry climate is less beneficial than cold—that is, always to the vital resistance, and generally to the disease.

"Apparently, humidity of the air, apart from other factors, does not in itself produce phthisis. The comparative immunity from consumption among the men of the British navy

contrasted with those of the army, and the rarity of the disease in many islands, such as the Faroe, the Shetlands, the Hebrides, and Iceland, show this. The influence of these climates and of sea voyages on the disease when developed and active has, however, not been shown by the evidence of others, nor by my own observation, to be advantageous, removals from the sea being generally of most benefit. Where advantage has been derived from a sea climate it would appear probable that it was owing to the great purity of the air or the elimination of unsanitary conditions and hurtful occupations.

"Dryness of the air, on the contrary, is known to be of positive benefit to the consumptive. The excellent results obtained from desert air (apart from great altitudes, which we will consider later) are too well known to quote at length.

"In crediting dryness of air *per se* with a beneficial influence upon phthisis, we must not forget that some of the credit, at least, belongs to other necessary accompanying factors of a dry atmosphere—namely, more powerful sunlight and heat, less depressing cloudy weather, cooler nights and shade, and a higher electric tension of the body. What is also of prime importance is the greater opportunity for exercising and resting in the open air, and the free access of fresh air to the house by day and by night while the patient is indoors."[1]

Range of Temperature. Hirsch writes that "severe and sudden changes of temperature have no more determining influences *per se* than has the absolute height of the temperature." He shows further, however, that variability, if accompanied by dryness, is usually beneficial; but variability with dampness is positively harmful. These statements are confirmed by the evidence of many other authorities.

Wind. "Consumption is neither more nor less prevalent in a place simply because it is windy, nor are consumptives as a class made better or worse by this element alone. It is beneficial or detrimental according to its temperature and humidity

[1] "Handbook of Medical Climatology," by S. E. Solly, M.D. Philadelphia: Lea Brothers & Co., 1897.

and the patient's condition—that is, according to his need of stimulation or sedation.

"Cold moist wind sometimes soothes, but more often depresses the patient, while it aggravates catarrhal affections if they be of a relaxed type.

"Cold dry wind simply stimulates or else irritates the patient, and hence it improves relaxed catarrhal conditions, but makes those which are inflammatory worse.

"Warm moist wind lessens irritability, and is either soothing or depressing.

"Warm dry wind acts as a tonic or increases irritability."[1]

Sunlight. Sunlight promotes healthy growth, increases the oxidation of tissue, and is a pleasant stimulant to the nervous system. Sun-heat is the best and cheapest of germicides, and is valuable as provocative of open windows and an open-air life. When moderate it is an agreeable sedative; but when excessive, with dry air, it is very irritating to the nervous system, interferes with the proper action of the liver and kidneys, and prevents the taking of beneficial exercise.

While the dryness of the air makes the sensible temperature lower, yet when the temperature is absolutely high it much increases its irritating and so weakening effects, though, at the same time it may be markedly beneficial in drying up ulcerative processes in lung tissues. Excessive heat with dampness is not irritating, but far more depressing, and accelerates tuberculous processes.

Barometric Pressure. Hirsch has shown most conclusively that decreased barometric pressure tends to confer more or less immunity from phthisis.

The marked decrease which is present in all high climates has been demonstrated by Egger and many other observers to have a remarkable effect upon anæmia by increasing the amount and quality of the red blood-corpuscles and hæmoglobin. That these blood changes are brought about, not by the qualities of dryness, sunlight, or other climatic factors in high or other

[1] Ibid.

climates, but by the diminished barometric pressure, was proved conclusively by the classic experiment of Regnard, who at sea-level kept a rabbit in a bell-glass under diminished air pressure equivalent to the atmosphere at 6000 feet elevation for a month. When the rabbit was removed it was found that the same blood changes had taken place as occurred in rabbits transferred from sea-level to a climate at 6000 feet elevation.

The rapid and remarkable improvement in the local and general conditions coincident with these blood changes in consumptives transported from sea-level on to high ground of 3000 feet and upward has been demonstrated by numerous careful observers in Europe and in North and South America. As far as we at present know, the only successful means of combating chronic tuberculosis is by improving the resisting power of the blood; it therefore follows that that climatic factor which most fully and directly brings this result about is the one to be especially regarded in choosing a climate for the cure of consumption. There are, however, other considerations which enter into the question of the appropriate climate for a given case of consumption. These are mainly the effects upon the heart, nervous system, and the mucous membranes of the respiratory tract, for the climate may be ideal in directly opposing the development of the disease germs, yet if it mechanically embarrasses the efficient action of the heart, or over-excites or depresses the nervous system, or by its stimulation aggravates and increases the irritability of the pneumonic or catarrhal process, or, on the other hand, by its extreme sedation and therefore depressing effects, aggravates them, it may be unsuitable for a given case.

As confirmatory of the general effect of climate in the treatment of tuberculosis as demonstrated by the physiological experiments just spoken of, I refer you to the analysis of some 8000 cases of phthisis treated by climate, given in my work upon *Climatology*. They were all the reports that a careful search through the literature of the subject revealed to me. The number being so large, it may be fair to assume that the law of averages justifies a belief in the general truth of the

statistical results attained. The reports are by a number of eminent observers from all parts of the world, and were readily grouped under the following heads: Under the title of home climates are placed those which remained in the same climates in which the disease developed; sea climates (ocean, island, coast); ocean covers only those who took sea-voyages; lowland climates (lowland, sanitarium, desert); highland; the last covers only reports of cases treated in climates above 5000 feet altitude.

The statistics show an almost steady rise in the percentage of improvement from the ocean to the altitudes. The percentage of improvement among those who took sea-voyages was 54 per cent.; in lowland climates 57 per cent.; in lowland desert climates 65 per cent.; while in altitudes the improvement runs up to 77 per cent. From this we learn two things: that, as a rule, the consumptive improves the further he is removed from the sea influence, as shown in the contrast of the percentage of 54 and 65; and, further, the benefit of altitude over lowlands, even in desert life, is shown by the difference between 65 and 77. Therefore, while the desert air of Arizona will cure more cases of consumption than the sea air of the coast, say of southern California, yet it will not cure as large a proportion as will the mountain air of the highlands.

In deciding what cases are exceptions to these general rules, it will be well roughly to classify cases of phthisis as follows: those in whom the tendency to the spread of tuberculosis is the most prominent symptom, which may be called, for convenience, the tuberculous cases. Second, those consumptives in whom there is an especial tendency toward inflammatory processes, and those persons are usually of the erethic temperament; this group may be termed the pneumonic. The third division is into those in whom there are catarrhal tendencies of a relaxed or low inflammatory type. Such cases are usually anæmic, and have phlegmatic temperaments; this group may be termed the catarrhal. It is, of course, understood that all are tuberculous, and most have some tendency toward inflammation, or catarrh, or both.

As in the tuberculous cases the important matter is to destroy the germs and remove the anæmia, it follows that these cases should be placed on high ground where the air is not only dry and sunny but also cool and stimulating. When the patient is able to exercise, the cooler air, such as is found during the winter in most resorts of Colorado, is most desirable, and the cure progresses more certainly and rapidly. The cold acts more beneficially than the heat upon the usually depressed nervous system of this class of cases, and also induces greater appetite and increased vitality. When patients are too feeble to exercise, it is sometimes best to begin their cure in a warmer and lower climate, and later to transfer them to the higher and cooler regions.

With respect to the effect of altitude upon the heart, the tendency in the young toward dilatation from a weak muscle is not a contra-indication for the use of a high climate, if the patient is kept extremely quiet for the first few weeks after his arrival. But in persons past middle life, and in those in whom the dilatation is accompanied by damaged valves, high climates are dangerous. Valvular disease with good compensation is not necessarily a bar; but time does not permit the discussion of this subject in further detail.

With respect to the effects of altitude and cool air upon nervous irritability, it is necessary to distinguish between the irritability of weakness and the inherent irritability, such as is exhibited in the erethic type. The former is benefited, the latter injured, by altitude and coldness. A desert air benefits, though in a lesser degree, the first class of cases, and it aggravates the condition of the second class by its excess of heat and dryness. Old age and atheromatous conditions are unsuitable to high and to cold climates.

The extent of lung involved plays an important part in determining the elevation most beneficial to the patient. If marked dyspnœa, due to the extent of the lung involvement, and not to the anæmia or weak cardiac muscle, is present at sea-level, a case with this symptom must be kept on low ground. This particularly applies to obstruction in the left lung.

With respect to the pneumonic cases, the altitude must be moderate, and also the dryness, while in the catarrhal cases the altitude should be a medium one, because of the susceptibility to cold-catching from the sudden changes, and also because a greater warmth of air is needed than for the purely tuberculous cases; but dryness is of paramount importance.

To turn from this brief consideration of pathological conditions to a short discussion of the different effects of the region under consideration, it may be said that in the winter climate of such places as Yuma, at 140 feet elevation, we find the benefits of dryness and heat. At Phœnix (1100 feet) similar conditions prevail, modified as regards local humidity by the irrigation which produces a light morning and evening fog. The heat, however, is not as excessive, and the accommodations and general resources are much better.

At Tucson, 2400 feet up, we still find much of the influence of desert air, with some indications of the benefits derived from elevation. Here the accommodations, while not as good as those at Phœnix, are rapidly improving. El Paso and Las Cruces, 3700 and 3800 feet respectively, are near together and very similar in climate. El Paso is more dusty, and has some of the resources of a city. It is probably more subject to wind storms than Las Cruces, which is better sheltered and cleaner, but less interesting.

Oracle, 4500 feet, forty miles stage ride from Tucson, is removed from the dust and turmoil of the cities, and is said to be pretty and attractive, with two fair hotels, a pleasant country to ride and drive over, but few interests.

Prescott, 5300 feet, has many points of climate in its favor, but has practically no resources for invalids.

Silver City, 5800 feet, has a remarkably fine climate, but indifferent accommodations and few interests except mining.

Santa Fé stands at 7000 feet elevation, has a magnificent climate, and is an interesting town with fair accommodations, but unsanitary conditions.

Las Vegas, 6500 feet, gives no weather report. It has a good winter climate, but the accommodations are inferior.

The Las Vegas Hot Springs, 7000 feet, are in a cañon. There is a fine hotel here, which, however, is very seldom open; the place has a good climate, but is monotonous and uninteresting, and the springs are almost negative in their therapeutic qualities.

Cañon City, 5300 feet, is a warm, sheltered, pleasant winter resort. It is a quiet but agreeable little town, and the accommodations are very fair.

Denver, 5300 feet, is colder and more exposed, but probably is somewhat dryer and has a better soil than Cañon City. It has the resources and objections necessarily associated with a handsome and progressive city of 150,000 inhabitants.

Colorado Springs, 6000 feet, has about the same winter temperature as Denver; is slightly dryer; has less snow, but rather more wind. It was laid out as a health resort upon a mesa near to, but sufficiently removed from, the shadow of Pike's Peak. It is a handsome residential town without manufactories, and with first-class resources of all kinds and beautiful suburbs.

Estes Park, 7200 feet, is a beautiful mountain valley. It is much used by invalids with great benefit during the summer months, and a few have wintered there, finding it at that time monotonous but healthful, and the weather much milder than was to be expected. The accommodations are fair. There are other parks, such as Manitou Park, that are pleasant and healthful for summer-residence, similar in climate and in character, but of which no reports are forthcoming. Manitou Park has especially good and attractive accommodations and resources.

In comparing all these resorts, it may be said that Colorado Springs possesses the most stimulating, and Yuma the least stimulating climate.

The winter and fall climate of all these places is good, and is more bracing the greater the altitude and higher the latitude.

The spring weather in New Mexico and in Arizona is, as a rule, much better than that in Colorado.

The summers on the high ground of Colorado are cooler and pleasanter, and they are as dry as those of like elevation in

New Mexico and in Arizona, where the resorts of moderately low elevation are impossible, on account of excessive heat.

There is generally more wind in the more northerly and elevated resorts; the dust, however, is more objectionable in the more southerly and lower resorts, because the soil is usually adobe (clay) and alkaline, and so rises readily in the form of a light irritating powder, while on the high ground the soil is more apt to be gravel or granitic detritus.

Annual Averages.

	Elevation (feet).	Latitude.	Soil.	Normal air-pressure.	Temperature.			Humidity.			Rainfall.	Number of cloudy days.	Mean monthly wind-movem't.
					Annual	Jan'ary	July	Relative.	Absolute	Dew-point.			
Estes Park	7200	40° 0′	Gravel.	.....	40°	24°	60°	...	.....	...	16.31		
Santa Fé	7000	35 41	Gravel.	23.26	49	28	70	48	1.79	30	14.6	48	4681
Colorado Springs	6000	38 51	Gravel.	24.03	47	26	69	50	1.84	29	14.4	57	6666
Silver City	5800	32 46	Gravel.	24.26	54	37	72	50	2.47	36	14.58	37	2476
Glenwood Springs	5700	.....	Adobe.	.....	48	22	78	...	.....	...	15.96		
Boulder	5300	40 0	Sand.	.....	47	...	...	...	.....	...	19.21		
Denver	5300	39 45	Sand and adobe.	24.73	50	27	73	50	2.04	31	14.4	57	4980
Cañon City	5300	38 30	Adobe.	.....	53	32	74	...	.....	...	11.38		
Prescott	5300	34 33	Sand and adobe.	24.74	53	34	74	51	2.31	35	16.0	51	4898
Pueblo	4700	38 18	Adobe and sand.	25.27	52	29	76	49	2.14	31	12.0	53	5438
Oracle	4500	32 50	Gravel.	.....	63	45	80	22[2]	.....	26[2]	17.7		
Las Cruces	3800	32 17	Adobe.	26.11	58	39	77	65[2]	.....	47[2]	7.0	20	4948
El Paso	3700	31 47	Adobe.	26.21	64	44	83	48	3.16	40	9.0	39	3941
Eddy	3200	31 0[1]	Adobe.	.....	63	43	82	...	.....	...	11.0		
Tucson	2400	32 14	Sand and gravel.	27.45	69	50	88	42	3.25	44	12.0	57	3735[2]
Phœnix	1100	33 28	Adobe.	28.77	69	49	90	45	3.5	42	7.0	52[2]	3379
Yuma	140	32 44	Sand.	29.92	72	53	92	46	3.91	49	3.0	21	4570
Cairo, Egypt	90	30 31	Sand.	.....	72	54	86	61	5.42	58	0.53		

[1] Approximate.

[2] 1896

Spring Seasonal Averages.

	Seasonal temperature.	Night temperature.	Relative humidity.	Absolute humidity.	Rainfall.	No. of cloudy days.	Hourly wind-movement.
Estes Park	.....	.....	.....	.....	6.19		
Santa Fé	48°	35°	36	1.37	2.3	11	7.5
Colorado Springs	49	32	46	1.81	4.5	20	11.8
Silver City	53	.....	.....	.....	.....	...	8.8
Glenwood Springs	27	.....	.....	.....	4.9		
Boulder	49	.....	.....	.....	0.80		
Denver	48	33	49	1.88	5.8	20	7.4
Cañon City	52	.....	.....	.....	4.2		
Prescott	51	36	44	1.86	3.1	7	8.4
Pueblo	51	34	45	1.90	3.6	20	8.8
Oracle	60	48	.....	.....	1.5		
Las Cruces	58	.....	.....	.....	0.4	18[1]	
El Paso	64	50	36	2.36	0.6	6	6.7
Eddy	64	.....	.....	.....	0.4		
Tucson	62	47	37	2.27	1.2	5	5.3
Phœnix	67	.....	33	2.23	0.3	7	5.6
Yuma	70	54	43	3.43	0.3	4	6.7
Cairo, Egypt	74	.....	52	4.94	0.13		

Summer Seasonal Averages.

	Seasonal temperature.	Night temperature.	Relative humidity.	Absolute humidity.	Rainfall.	No. of cloudy days.	Hourly wind-movement.
Estes Park	57°	.....	.....	.....	4.25		
Santa Fé	64	55	43	2.82	6.6	12	6.4
Colorado Springs	67	51	50	3.62	7.2	11	8.0
Silver City	72						
Glenwood Springs	69	.....	.....	.....	3.8		
Boulder	65	.....	.....	.....	7.7		
Denver	70	55	46	3.67	4.5	12	6.7
Cañon City	72	.....	.....	.....	4.2		
Prescott	70	56	48	3.83	6.1	9	7.2
Pueblo	73	56	44	3.87	5.0	10	7.5
Oracle	78	68	.....	.....	6.5		
Las Cruces	76	.....	.....	.....	4.7	21[1]	
El Paso	83	68	45	5.40	4.1	6	5.2
Eddy	80	.....	.....	.....	7.1		
Tucson	82	69	40	4.65	5.4	12	5.1
Phœnix	87	.....	41	5.55	2.7	10	4.8
Yuma	89	73	43	6.18	0.5	3	6.6
Cairo, Egypt	86	.....	51	6.84	0.0		

[1] 1896.

Autumn Seasonal Averages.

	Seasonal temperature.	Night temperature.	Relative humidity.	Absolute humidity.	Rainfall.	No. of cloudy days.	Hourly wind-movement.
Estes Park	43°	.....	.....	.....	2.31		
Santa Fé	56	39	56	2.81	3.5	8	5.7
Colorado Springs	48	34	54	2.05	2.0	13	8.2
Silver City	55						
Glenwood Springs	47	.....	.....	.....	4.2		
Boulder	49	.....	.....	.....	2.0[1]		
Denver	50	38	50	2.04	2.3	12	6.4
Cañon City	53	.....	.....	.....	1.6		
Prescott	53	37	49	2.21	2.7	4	5.9
Pueblo	52	37	50	2.19	1.7	13	6.0
Oracle	65	54	.....	.....	5.6		
Las Cruces	59	.....	.....	.....	1.5	12[2]	
El Paso	62	50	56	3.44	3.0	7	4.6
Eddy	65	.....	.....	.....	2.6		
Tucson	68	51	43	3.22	2.4	4	5.1
Phœnix	69	.....	56	4.40	1.7	7	4.4
Yuma	73	57	46	4.04	0.7	3	5.1
Cairo, Egypt	73	.....	70	6.32	0.03		

Winter Seasonal Averages.

	Seasonal temperature.	Night temperature.	Relative humidity.	Absolute humidity.	Rainfall.	No. of cloudy days.	Hourly wind-movement.
Estes Park	24°	.....	44.7	.....	3.56	13	
Santa Fé	30	20	52	1.02	2.3	13	6.8
Colorado Springs	29	17	50	0.94	0.7	13	8.4
Silver City	37	.....	49	1.25	1.0		
Glenwood Springs	27	.....	.....	4.9			
Boulder	24	.....	.....	.....	1.51	13	
Denver	30	16	54	1.06	1.8	12.1	7.3
Cañon City	34	.....	.....	.....	1.8		
Prescott	36	27	57	1.40	5.0	8	6.3
Pueblo	31	15	57	1.16	1.4	11	7.0
Oracle	45.2	37	.....	.....	4.1		
Las Cruces	43	.....	43	1.37	1.17	11[3]	
El Paso	46	33	52	1.84	1.3	9	5.4
Eddy	40	.....	.....	.....	1.0	12	
Tucson	49	35	48	1.89	3.0	11	5.0
Phœnix	51	.....	53	2.20	2.6	11	4.4
Yuma	56	43	47	2.36	1.6	6	6.1
Cairo, Egypt	58	.....	70	3.57			

[1] Total rainfall for Boulder is taken from one year only; September is missing. The wind and humidity of Phœnix is based on one year only.

[2] 1896.

[3] Approximate.

THE SALICYLATE TREATMENT OF HÆMOPTYSIS.

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Every practitioner knows how futile is the direct drug treatment of hæmoptysis. Gallic acid, tannin, ergot, geranium, hamamelis, digitalis, etc., in spite of their frequent disappointment, seem to form our popular sheet anchors in the treatment of this affection. Nor need we be surprised at the little help these agents give us if we look at the chasm which exists between what they are capable of doing and what we expect of them. In hæmoptysis we have good reason for believing that there exists a break in the continuity of the walls of the pulmonary capillaries, and there is equally good reason for believing that by contracting these bloodvessels through the agency of the above-named drugs, we may be able to check the bleeding. Now, not one of these drugs has a known elective action on the respiratory organs like ergot has on the uterus, for example, and hence the vascular contraction which they produce must be shared by all the vessels of the body, and the general blood-tension must be generally increased. Does not this action enhance the blood-pressure in the frail and already permeable pulmonary capillaries, and increase rather than diminish the liability to further blood-spitting? Is there not more wisdom in the old, but nigh forgotten, practice of diminishing the blood-pressure by active catharsis, or by cupping, or venesection?

Whatever else may be true of hæmoptysis, I believe that this disease may in some way and in some cases be brought

about by toxic agents residing in the blood or in the tissues. I believe that the poison of syphilis is one of these, and that uric acid is another. So far as uric acid as a cause of hæmoptysis is concerned, the effects of which I shall only discuss in this paper, I have been led, or rather driven, to this conclusion by the following experiences:

About a year and a half ago, a young man, aged eighteen years, came under my care with rather copious hæmoptysis, which had continued off and on for about a month before I saw him. He has a marked heredity to pulmonary consumption and asthma on both sides of his family, and his father was inclined to be somewhat rheumatic. On my first visit he did not seem to suffer much from the loss of blood which he sustained, but complained of a fulness and constriction in his chest, and of an inability to take a full breath, and that his hands and forearms were numb and "felt as if they were asleep." There were very few physical signs in his chest that gave any indication as to the source of the bleeding. I gave him morphine hypodermatically, and ergot, hamamelis, geranium, and quinine by the mouth. During the following forty-eight hours he had several large hemorrhages, and the other symptoms remained as before. On the third day, much to my surprise, he began to develop a slight but distinct pain in the finger-joints, wrists, elbows, and shoulder-joints, and the numbness in his forearms was probably a little more marked. The bleeding continued unabated. I placed him on the salicylates for the purpose of helping the rheumatism, and as soon as these had been given for half a day both the rheumatism and hæmoptysis disappeared. The oppression in the chest and the numbness in the arm disappeared simultaneously with the hæmoptysis. Although I had given the salicylates before in pulomonary diseases associated with hæmoptysis, it never occurred to me that there is such a close causative relationship between the rheumatic diathesis and hæmoptysis, until the above-described case impressed this so vividly on me.

Immediately after this experience I began to search for

informaton concerning the action of the salicylates in hæmoptysis, but was unable to find any reference to it, except in the work of Dr. Alexander Haig on *Uric Acid in Causation of Disease*—a work which for scientific research and for pregnant clinical suggestion stands unequalled in practical medicine today. In Chapter V., on Pulse Tension (third edition), this author expresses the opinion that uric acid raises the blood-tension, and that drugs like the salicylates, nitro-hydrochloric acid, mercury, and lead clear the blood of this poison and lower arterial pressure. He says (page 179): "The great importance of reducing blood-pressure in arterial hemorrhage must be obvious, and these considerations led me to use the iodide of mercury in the treatment of hæmoptysis, with results which have often seemed to me to be very satisfactory. . . . I often found, however, that the hæmoptysis returned when I left off the iodide of mercury, till I took to following it by salicylates."

My first experience with the salicylates in the treatment of hæmoptysis associated with or followed by active rheumatism was thus forced upon me in a measure by the logic of events, but I soon learned that these agents had a wider therapeutic range than would seem to be indicated by this case. I now believe that very many cases of hæmoptysis, excepting some of those, of course, in which the blood proceeds from a cavity, are in some way associated with the uric acid diathesis, or with some causative element which is favorably influenced by the salicylates. It is not necessary in any case of hæmoptysis to wait for a simultaneous development of an attack of rheumatism before giving the salicylates, but it is important to make a careful inquiry into the personal and family history of the patient for any rheumatic tendency, and if found I believe that these agents should have a trial. The following two cases are excellent examples of many similar ones which are constantly met in practice:

C., aged thirty-four years, married; mother alive and well, came to me in July, 1895. Father died at the age of sixty-five years of rheumatism, but there is no lung disease in the

family. He had a severe attack of hæmoptysis the day before I saw him, had been losing in flesh, and coughed for a year and a half, without much expectoration, during which time he also had pain in the whole of his right chest. His appetite was poor, tongue thickly coated, bowels regular, and he slept poorly. There was no dyspnœa on exertion, but he felt tired most of the time. He had no chills, fever, nor night-sweats. He never had rheumatism, and was a man of steady habits. His chest showed impaired movement and weakened respiratory murmur over the whole of the right lung, and breathing was somewhat exaggerated in the left. Diffused dulness over the whole of the right lung. His pulse was 86, respiration 28, temperature 99⅘°; weight 140¾ pounds, and his stature 5 feet 10½ inches. He was placed on the sodium salicylate, quinine, and strychnine. The blood-spitting, which continued during my examination, ceased, and he made an uninterrupted recovery. In the following October he weighed 156½ pounds, and was able to go to work. From this time on I saw very little of him until January 15, 1897, when he had a violent attack of articular rheumatism which involved every important joint in his body. At this time he weighed 141 pounds. He promptly recovered under the influence of sodium salicylate and cinchonidia salicylate in large doses. After the acuteness of the attack had subsided, he was placed on the following combination: ℞.—Sodæ salicylatis, ʒijss; cinchonidiæ salicylatis, potassæ acetatis, āā ʒj; vini colchici, rad. fl ʒijss; tinct. digitalis, fl ʒij; tinct. cinchonæ comp., fl ʒj; aquæ menth. pip., q.s. fl ʒiv.—M. Sig.—One teaspoonful four times a day. He took this until the last of March, when he weighed 149 pounds, and then discontinued it, although he still had some pain in his right chest. About two weeks after this he began to expectorate blood, which was checked by the resumption of the above-named salicylate mixture. He feels well, is working, and continues gaining in flesh.

Neither before nor for a year and a half after the first attack of hæmoptysis was there evidence of any personal his-

tory of rheumatism in this case, excepting the pain in the right side of the chest. That the hæmoptysis was of rheumatic origin there is very little doubt in my mind, because it yielded so promptly in the first place to antirheumatic treatment, and in the second place, because there was an active manifestation of this diathesis afterward, and still later an attack of hæmoptysis, both of which were relieved by the same measures. Moreover, the fact that his father's death was caused by rheumatism makes it probable that a rheumatic tendency was inherited by the son. This case, therefore, teaches the importance of closely scrutinizing every case of hæmoptysis with a view of discovering a rheumatic element, and in case this is not found I think it well to develop the diagnosis with the aid of therapeutics, by administering the salicylates.

The following case shows the value of the practical applicaiton of the principle just advocated:

L., aged eighteen years, had an attack of hæmoptysis, which, for profusion and abundance, and from a chest without excavation, exceeded anything I ever met before. The application of the ice-bag in conjunction with the administration of the salicylates promptly checked the bleeding. Now, in this case there was no personal or family history of rheumatism except in the case of a maternal aunt, who died of chronic albuminuria complicated with rheumatism. In the course of a week after the salicylates had been begun this patient became subject to pain in the left elbow and knee-joint, for the appearance of which I am unable to account, although it speedily abated in a few days. The patient made a good recovery. At the time of his hemorrhage he weighed 145 pounds, and he now weighs 181 pounds. Every abnormal physical sign, except a slight dulness in the right apex, has disappeared. For several months he took the salicylate mixture which was prescribed for the previous case, in combination with strychnine.

In conclusion, I express my belief that the salicylates are

not only useful in the treatment of hæmoptysis, but that they are valuable remedies in many other chest affections. Instead of rheumatism being an antagonistic condition to phthisis and to other pulmonary diseases, it seems to pave the way for their advent, and very often their whole course is modified by the administration of the salicylates.

ON SOME OF THE VAGARIES OF CROUPOUS PNEUMONIA AS SEEN IN CENTRAL NEW YORK.

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The deductions which are presented in this paper were reached after a consideration of one hundred and fifty cases of pneumonia seen in private, consultation, and hospital practice, in all of which careful records were kept. It occurred to the writer as he examined the records of these cases that it might be of interest to this Society and to the profession to learn something of the peculiarities of croupous pneumonia as we see it in Central New York.

I was surprised to find many cases in which, at some time during the course of the disease, unusual features presented themselves, frequently making a positive diagnosis impossible; in other cases obscuring the diagnosis of pneumonia which had already been made.

The pneumonia of Central New York may be considered the most typical disease of an infectious nature which the physician is called to treat. In 80 per cent. of our cases the characteristic chill, with the fever and all of the other usual symptoms of the disease, followed each other in regular order, the disease running a typical course in from six to eleven days. In 20 per cent. of our cases however, there were vagaries which occasionally masked the diagnosis. In these careful and acute diagnosticians became puzzled during a period —the length of which varied—before objective signs or subjective symptoms made an accurate diagnosis possible.

It is to these cases that I wish particularly to call your attention.

The one hundred and fifty cases are tabulated as follows:

Between	1	and	6	years	2
"	6	"	10	"	2
"	11	"	15	"	3
"	16	"	20	"	31
"	21	"	25	"	29
"	26	"	30	"	18
"	31	"	35	"	15
"	36	"	40	"	13
"	41	"	45	"	12
"	46	"	50	"	11
"	51	"	55	"	4
"	56	"	60	"	2
"	61	"	65	"	3
"	66	"	70	"	2
"	71	"	75	"	1
Over			75	"	2

The right lung was involved in 60 per cent. of our cases, the left lung in 24 per cent., both lungs in 16 per cent. The localization of the disease in the various parts of the lung corresponded very closely with that given by Jurgensen, Grisolle, Busse, and other voluminous writers on this disease. There were twelve cases in which the apex was involved. In seven of these the right apex was diseased; in five the left.

It may be remarked in connection with apex pneumonia as we see it in Central New York that it is not associated, as a rule, with active cerebral symptoms which justify us in speaking of the disease as synonymous with cerebral pneumonia. Indeed, the majority of our cases had less delirium than was found with involvement of other parts of the lung, and most of these followed a typical course, terminating by crisis without further complication.

We do not include among this number those forms of mixed infection, to which attention will be called later, in which the active pneumonia attacked an apex the seat of tuberculous disease.

One of our apex cases was a traumatic pneumonia in a boy, eleven years of age, who had sustained a fracture of the skull three days before the onset of the disease. His mind was at all times clear. He made a full recovery.

In 14 per cent. of the cases in adults the initial chill was absent. The chill was likely to be absent in cases of pneumonia occurring in alcoholics or in aged and enfeebed subjects, and in most of the severer forms of the disease occurring in children. It is rare to find evidence or hear complaint of a chill in the subjects of croupous pneumonia before the age of ten years. The disease is more frequent in early life than it was formerly supposed to be. In a number of our cases of secondary croupous pneumonia, particularly those associated with or following other infectious disease, the chill was absent; the first evidence of the disease was marked increase of the fever already existing, with more hurried respiration. Positive physical signs were absent for from one to three days in these cases, the symptoms of the primary infection were intensified, a true typhoid condition developed, with characteristic sputum, while the objective symptoms followed on the third or fourth day of the pulmonic complication.

In 30 per cent. of grippe pneumonias of the croupous variety the disease developed gradually after a period of malaise with the usual symptoms of influenza.

70 per cent. of grippe pneumonias were ushered in with a well-defined chill, severe, but characteristic of the ordinary form of the disease. When this occurred we found that the disease was of much shorter duration than in those cases without chill; that it was associated with a more sthenic condition of the patient, and gave a decidedly better prognosis. In a few cases of grippe pneumonia we were surprised to find large areas of consolidated lung-tissue, sometimes remnants of recent pneumonias, without marked subjective symptoms, but with positive physical signs, in which these conditions had not been suspected by the patient or by the physician. Many of these cases dragged along during a number of weeks with but little sputum; at times there was for a day or two marked rusty sputum; during the latter weeks of the disease the sputum was usually mucopurulent, nummular, finally disappearing as gradually as did the physical signs. Most of these patients made a full recovery. The microscopic

examination of the sputum showed the presence of the pneumococci of Fraenkel and Friedlander, frequently streptococci in abundance.

It can be readily understood that these cases aroused a suspicion of existing tuberculosis. The microscope served to differentiate this latent form of pneumonia from the tuberculous infection which we have learned to fear as a complication or sequel of grippe. No cases of the disease were more difficult to diagnose than were those of *central pneumonia without chills* occurring in children, occasionally in adults, with marked gastric symptoms, slight jaundice, abdominal distress, and pain. In many of these there was but little cough during the first twenty-four hours; hurried respiration with a continuously high temperature were the only accompanying symptoms. The physician who has had much to do with pneumonia of the croupous variety occurring during early life has learned from his experience to be suspicious of the presence of the disease with persistently rapid respiration and elevation of temperature, though other marked pulmonary symptoms of a subjective or objective character are absent.

Abdominal pain misled a number of physicians with whom I saw these cases, and when this was associated with slight jaundice, central pneumonia had not been suspected. In the case of a child, five years old, with the symptoms just mentioned, we found tympanitic resonance over the lower lobe of the left lung persisting for two days without other physical signs, save bronchophony over a small area; gradually it became evident that a central pneumonia was spreading toward the surface; bronchial breathing with crepitant râles became clear. The child died after three weeks with every portion of both lungs consolidated.

The method of Leube by which he searches early for an area of bronchophony in these cases, and in which after twenty-four or thirty-six hours he has found confirmatory sings of the disease in bronchial breathing and crepitant râles, has often proved an important aid; but it, too, has occasionally failed or has been absent.

It may be safely concluded that the cases of pneumonia without chill were, as a rule, of the asthenic variety; but they ran a protracted course, rarely terminating before the eleventh or thirteenth day, usually by lysis, and in a large number there was an alarming typhoid condition which developed sometimes during the fourth or sixth day, with profound nervous symptoms, muttering delirium, considerable albuminuria, feeble and rapid pulse, death usually ending the scene with less evidence of carbonic-acid poisoning than was found in the equally serious sthenic cases of the disease.

Anatomically these cases presented features which were noteworthy. Among these was the ultimate though diffuse infiltration of the lung; several foci were found, and the inflammation was prone to attack both lungs. The stage of red hepatization was short, the lung-tissue was soft, tore easily, and there was great tendency to puriform infiltration. The spleen was enlarged. In a number of these cases pleurisy appeared early, usually serous, sometimes purulent, but it was not at all unusual to find ultimate empyema after serous pleurisy.

Among the other complications of these cases, kidney involvement was common, and in a few cases endocarditis, pericarditis, or meningitis were the final sequelæ.

There can be no doubt that these forms of asthenic pneumonia without chills are increasing, and that the increased mortality of pneumonia in many sections of this and other countries is due very largely to that fact.

Another variety of pneumonia to which I wish to call your attention, and which is among the more difficult forms of the disease to diagnose, is found *with the symptom-complex of an acute meningitis.* There was not a single physical sign or subjective symptom to call attention to lung-tissue, but there was a clear picture of meningitis, often without respiratory embarrassment. In these cases the deep involvement of the brain is due to pneumococci toxins. In some of these we found on post-mortem a limited area of lung-tissue involved, usually central, without a single lesion or change in the brain

to account for the symptoms during life. These cases are not uncommon.

The cases included three of *afebrile pneumonia*. The ages of these were sixty-five, sixty-seven, and seventy-four years, respectively.

The first case occurred without any prodromata or initial chill, but had all of the characteristic physical signs of the disease involving the lower lobe of the right lung. There was rusty sputum. This patient had suffered for years from interstitial nephritis, with polyuria, a moderate amount of albuminuria, tense pulse, and arterio-sclerosis. The disease terminated fatally by crisis on the sixth day.

In this case the crisis was followed by an alarmingly low condition of the patient, which continued with profuse perspiration for almost twenty-four hours, the patient finally rallied, living six or seven years after his recovery, dying of uræmia.

The subject of the second case was also an albuminuric, with less marked arterio-sclerosis, but with evidences of secondary contracted kidney. The patient died on the fifth day of the disease. The diagnosis was confirmed by post-mortem. One-half of the left lung was completely consolidated, there were positive evidences of the second stage of croupous pneumonia. The heart was found hypertrophied in all directions, and the kidneys had undergone secondary contraction.

The third patient had been previously healthy, had no evidences of renal or cardiac disease, but had been subject to great nervous strain and was in a very much reduced mental and physical condition for two or three weeks preceding the onset of the disease. The case terminated fatally by lysis.

All of these cases were well nursed, carefully watched by trained attendants, the temperature taken four times daily. In none of these did the temperature at any time reach above 100.1° F.

There seems to be an antagonism between the pneumococci toxins and blood which is surcharged with urea or changed as the result of chronic nephritis. This fact has been

observed by a number of writers, and we are at the present time carrying on experiments to determine whether this conclusion is justified. It may be asserted still further that in all of the cases of afebrile pneumonia which the writer has observed there has been great nervous depression.

In several cases there was an afebrile period varying from one to three days, during which there was progression of pneumonic infiltration without preceding chill. On the third or fourth day the temperature began gradually to rise, reaching its maximum about the sixth day; the disease ultimately became asthenic. Death followed in the majority of these cases between the tenth and fourteenth days of the disease, with rapid pulse, but without evidence of carbonic-acid poisoning. In these cases we did not find preceding albuminuria, but the patients were also much reduced in strength and nerve-force before the advent of the disease.

Hyperpyrexia was frequently found in the sthenic forms of the disease as we saw it. We found it more frequent in hospital than in private practice. In fifteen hospital cases we found the temperature above 105° F. in five cases. In one of these the temperature reached 107.5° F., remaining there almost twenty-four hours before death. In two which recovered the temperature reached 106.2° F.

In private practice, in one hundred and thirty-five cases, we have only found the temperature above 105.5° F. in ten cases. Seven of these occurred in children. With corresponding involvement of lung-tissue it may be assumed that the temperatures of children range from $1\frac{1}{2}$° to 2° higher than in adults.

Among the unique clinical manifestations found in the cases collected was a condition to which the writer, a number of years ago, gave the name "post-pyrexial delirium."

Since reporting my first case I have noticed a number in medical literature, all of these presenting about the same features. We include four of these cases in our collection. In all of these the disease had been of sthenic variety. The febrile period averaged six days, during which the patients

were usually clear. Following the crisis, in from three to ten days, these patients became the subjects of active and wild delirium, in which they were restrained with difficulty—a true delirium ferox—without the slightest increase of body-heat.

In three of our cases the period of delirium continued between seven and twelve days, in the other the patient was wildly delirious during two weeks, then merged into an irresponsible condition in which she was easily controlled, making a final recovery after the fifth week.

The writer does not include in these cases of post-pyrexial delirium those forms of insanity and nerve depression which follow grippe, for in the majority of these there was more or less delirium during the active period of the disease, then the period of convalescence, and finally the train of nervous symptoms which, persisted for weeks and months, at times, lead to permanent insanity.

Among the vagaries of the disease we have occasionally noted a peculiar behavior of the pulse in the subjects of *arterio-sclerosis* with or without manifest renal complication. During a period varying from two to four days the pulse remained tense and slow, rarely reaching above 80. After this period the tension became suddenly lowered, the pulse became rapid, irregular, and intermittent; the patient died with all of the evidences of cardiac asthenia on the fifth or sixth day of the disease.

We have learned to fear this period of calm and slow pulse in the subjects of arterio-sclerosis, for it almost invariably led to a fatal termination, with sudden lowering of arterial tone and almost immediate cardiac failure.

Ambulatory pneumonia is rarely met in Central New York. In the cases reported there was only one in which this diagnosis was made positive by post-mortem. This case occurred in a man, forty-two years of age, who had been about for four days with the disease. He died within twenty-four hours after his admission to the hospital. The post-mortem showed the right lung entirely solidified, well advanced in

the second stage of the disease, with marked œdema of the left lung, the right half of the heart dilated, with a large thrombus extending into the pulmonary artery.

Among the cases of *malignant pneumonia* are three which occurred in one family within one week of each other. All of these died before the sixth day of the disease. The toxæmia seemed overpowering; the local disturbances were subsidiary.

Traumatic pneumonias are comparatively frequent. Particularly do we find these occurring after serious head injuries, and it has been the writer's experience to find the larger number during early life. In children these were almost always fatal.

Aspiration, or the "*Schluck pneumonia*" of the Germans, was found three times among our cases. Two of these recovered. The disease was protracted, and complications, particularly œdema of the lungs, were not at all unusual.

The only case of pneumonia which followed the inhalation of ether was that of a woman whose breast had been amputated for cancer. The disease was of the sthenic variety; there was a chill within twenty-four hours after the operation; the disease was severe, but ended favorably by crisis without interfering with the primary union of the wound.

It may be assumed that pneumonia following the inhalation of ether is a mere coincidence.

An annoying complication of senile pneumonia was the blocking of the bronchial tubes with retained mucus, with ultimate collapse of air-cells, all of which masked the physical signs of pulmonary infiltration.

In spite of the fact that we had several cases in which there was a characteristic intermittent fever, with, at the same time, advancing lung involvement, there were no data, microscopic or clinical, which justified us in assuming that we were dealing with added malarial infection. Quinine in these cases failed to influence the fever in any way. We saw no cases which justified the term "malarial pneumonia."

In three of our cases there was sudden and unexpected

death; once during the period of convalescence, twice after crisis, when a favorable prognosis had been given. These deaths were, in all probability, due to the effects of the toxins on the heart and the accompanying acute myocardial degeneration.

I do not include among this number those cases in which there had been preceding nephritis or other organic heart-disease. In this connection it may be added that the toxæmia is by far the most important element to be taken into account in considering the treatment and prognosis of pneumonia, and it is certain that in the majority of cases it stands in no relation to the extent of lung-tissue involved. Limited areas of disease have often been associated with more profound evidences of infection than were found with far-reaching consolidation.

85.5 per cent. of the cases terminated by crisis, 14.5 per cent. by lysis. The crisis occurred in the majority of cases between the fifth and eighth day of the disease. In one case it occurred on the thirteenth. The longest deferred crisis was noted on the fifteenth day.

It was not uncommon to have the fever continue with but slight fall until the eighth or tenth day, when crisis occurred. The old notion of the ominous uneven days is not justified.

Persistence of fever after the eighth day without positive evidence of fresh involvement of lung-tissue or other discoverable complication must lead to the suspicion of tuberculous disease. A sharp rise of temperature some time during twenty-four hours preceding crisis was not uncommon. A decided rise of temperature following crisis, sometimes three or four exacerbations, had alarmed many who were not warned of the possibility of such occurrence.

In twenty-four cases there were pseudo-crises. These occurred, as a rule, between the fourth and sixth days of the disease; the earliest was met in one case on the third, the latest on the twelfth day. After crisis and during the period of convalescence it was not uncommon to find one or two sharp rises of temperature without accompanying leucocytosis or other demonstrable complication.

The majority of cases of croupous pneumonia showed a *marked increase of the polynuclear leucocytes* in the blood during the febrile period, with a reduction of these as the temperature declined.

In thirty cases of croupous pneumonia in which we made blood-counts there were evidences of leucocytosis in twenty-two. The greatest number of white corpuscles were found immediately before the crisis. In all cases examined within thirty-six hours after crisis there was no further evidence of leucocytosis. As a rule, there was no reduction during pseudo-crisis; in two cases an increase of leucocytes was found. The occurrence and intensity of leucocytosis may be said to depend almost entirely upon the virulence of the pathogenic micro-organism causing the disease. This clinical fact is emphasized by the result of animal experimentation. We were unable to demonstrate satisfactorily any relation between the extent of the disease and the existing leucocytosis.

The malignant forms of pneumonia with far-reaching and rapid infiltration, also asthenic cases with or without extensive consolidation, particularly in those subjects who were poorly nourished, gave low counts.

For differential purposes it may be concluded that the presence of leucocytosis in acute febrile disease favors the diagnosis of pneumonia; that its absence favors the diagnosis of typhoid or a severe form of lung inflammation; that marked leucocytosis favors the diagnosis of croupous pneumonia against purulent pleurisy; that the presence of leucocytosis is a favorable but by no means a certain prognostic sign.

From the cases here considered we conclude that the *fully developed physical signs* which justify a *positive diagnosis of pneumonia are rarely present before the end of the second day of the disease;* it is not infrequent to find the third day without the characteristic breathing and râles of the typical disease. We have notes of several cases in which, with fully developed physical signs, there was no expectoration. The expectoration was typical in the majority of cases, but it, too,

was often atypical in color, consistence, and quantity. To this I will refer on another occasion.

It would draw this paper to a great length if the writer considered the complications met in these cases. Without going into detail it may be said that following heart weakness —œdema of the lungs—was one of the most serious disasters.

The various serous and purulent effusions were usually successfully treated. In one case the disease was complicated with abscess of the lung in which the pus was finally located after seven unsuccessful explorations with the hypodermatic needle, the abscess was opened and drained, the patient made a perfect recovery. Albuminuria was present at some time during the course of the disease in over 90 per cent. of the cases. In 10 per cent. of these there were evidences of nephritis.

In considering the clinical material at our command we cannot ignore those forms of mixed infection which have been brought to light by bacteriological study of our cases.

We include under this head those cases of tuberculosis which are accompanied by inflammatory processes in the lung, caused by concurrence of two or more infecting agents, one of which is the tubercle bacillus. The fact has been repeatedly demonstrated, experimentally and clinically, that the tubercle bacillus alone, without the presence of other infecting agents, has the power of causing changes in the lung which simulate very closely the various forms of acute and non-tuberculous pneumonia.

Clinically corresponding cases are necessarily differentiated with great difficulty, and require repeated microscopic examination of the sputum (the centrifuge aiding us materially) before a positive diagnosis can be made. It is possible to have two pathologic processes in many of our cases of pulmonary tuberculosis—one leading to the formation of tubercle, the other giving rise to pneumonic infiltration.

These cases I have classified as follows:

1. Cases of acute fibrinous pneumonia, in which the disease attacks an area of lung-tissue, the greater part of which

is the seat of infiltrating but latent tuberculosis. The previous history includes disease in a distant organ, from which pulmonary tuberculosis took its origin or with which it was coincident. The latent pulmonary deposit, as a rule, did not give rise to subjective symptoms before the advent of the acute pneumonia.

2. (*a*) Cases in which there is an acute croupous or catarrhal pneumonia in the immediate vicinity of tuberculous areas, the latter previously recognized, with changes in the infiltrated areas, usually at the apex; the fibrinous disease running its course and terminating by crisis or lysis. The disease is not associated with hæmoptysis as a prodromal or initial symptom. (*b*) Cases of chronic or subacute pulmonary tuberculosis in which acute catarrhal or croupous pneumonia attacks distant areas of the diseased or opposite lung, in which there is no early hæmoptysis, but the tuberculous process is actively progressive, with physical signs of beginning or already completed disorganization.

3. Cases which may be called streptococcus pneumonia, in which the disease is added either to a latent or an active pulmonary tuberculosis. Hæmoptysis is present usually during the early stage of the acute exacerbation or immediately precedes the pneumonia. Here the complication depends largely upon the aspiration of infecting agents from the seat of the original infiltration and ultimate disorganization.

4. Cases of acute catarrhal, occasionally fibrinous pneumonia, with concurrent bacillary infection, where, as a result of lowered vitality, resulting usually from childbearing, alcoholism, or unfavorable environment, there is in a comparatively short time rapid disorganization of lung-tissue ultimate cheesy infiltration, with the clinical evidences of coagulation necrosis, hectic fever, and death.

The most unique and at the same time surprising cases of mixed infection which have come to my notice are those in which there has been no suspicion of existing pulmonary tuberculosis antedating the accompanying pneumonia. There were no lung symptoms until the violent outbreak of croupous

disease, and in no case which I have seen had the physician been consulted to prescribe for the patient or examine the lung physically. The general appearance of the patient had in many cases been so good that during the early days of the acute pneumonia no suspicion of the true state of affairs was entertained, and not until it became plain that the pneumonia was not following a typical course and bacteriological examinations were made were the facts established which made it positive that we were dealing with mixed infection. In the majority of these cases the added element gave rise to a croupous pneumonia which involved the area of latent disease and the tissue immediately adjacent to it.

While there are in many of these cases no subjective complaints or objective symptoms of pulmonary tuberculosis before the appearance of pneumonia, careful inquiry and a thorough search reveal the fact that there have been foci in distant organs, from which pulmonary tuberculosis proceeded or with which it was originally closely related. Many of these patients have good family histories, while their record strengthens the conclusion that lung tuberculosis may be present, but dormant, awaiting the advent of some depressing agent or added pulmonary disturbance. In other words, lower by the addition of the second germ the resisting power of the patient who has an unsuspected tuberculosis, and, as a rule, the result will be tissue disorganization and consequent progression of the original disease. I know that this conclusion is contrary to the belief of many who attribute to mixed infection little influence on latent tuberculosis, and who prognosticate favorably in cases of this class; but I give it as being in accord with my own clinical experience.

CALOMEL AS A CURATIVE AGENT IN DIPHTHERIA.

By LEONARDO D. JUDD, M.D.,
PHILADELPHIA.

I PROPOSE to speak of the specific treatment of this terrible scourge from my individual experience, covering a period of fifteen years. I shall not burden you with a citation of many, but will select a few of the illustrative cases to demonstrate the treatment which I have learned to consider as the nearest to that of a specific of any I have known. When I state that, through my experience with this disease, and in the treatment of it, diphtheria has been robbed of its terrors, I utter that which is the offspring of a thorough conviction based upon the curative results obtained.

The treatment of diphtheria by mercury and its preparations is not new, but there has been no well-defined application of any one form of this drug which would inspire sufficient confidence or assurance to carry it to a successful issue. Trousseau gives in his graphic style a good argument, explanatory in part, of its action, and yet he plainly states that he has a dread of its use, because of the constitutional effects in "modifying the blood, augmenting its fluidity, and so changing its state that the secretion becomes less plastic;" and he goes on to say, "so far am I from denying the constitutional action of this medicine that I have a great dread of it, and I believe that the topical action is that alone which is of use."

It is the constitutional action that, in my estimation, is the effect to be sought after, as well as the topical, upon which I

lay great stress. Had the germ theory been as well understood in Trousseau's day as it is now he would have modified, if not entirely changed, his opinion relative to the action of this drug and its preparations in the treatment of diphtheria. That fearless exponent of the calomel treatment, the late Dr. Riter, of Pittsburg, also failed, as we can now see by light of modern research, to grasp the true philosophy of its action, yet he had no dread of the constitutional effects when skilfully handled and carefully guided. He claimed, in a letter to his friend and classmate, Dr. E. R. Squibb (as published in Squibb's *Ephemeris*, September, 1882) that "Diphtheria is a *functional disease of the liver*." "The remote cause, inspissated blood, and the thesis of infection, contagion, micrococci, etc., are moonshine, transcendental tomfoolery." "The approximate cause—*too much fibrin in the blood*." In the light of his etiology he fearlessly gave calomel, citing the case of a boy, eight years of age, to whom he gave a scruple in the first dose, and every hour ten grains until he had "half an ounce of calomel in his *primaviaria*, not *prostrated*, but *restored*." "I must here say," he writes, "my cases have been hundreds—never saw hypercatharsis—have had to give salines—never saw salivation or other mal-effect." It was his opinion, as is also mine, that in handling the severest type of diphtheria the danger lies, not in giving too much calomel, but rather too little, and in not having the courage to push the drug until the bowel action shows the characteristic discharge, which I shall mention later on. Whether right or wrong as to the etiology, he has piloted the way to overcome this scourge of humanity in the practical use of a drug theoretically admitted by great teachers to be most potent for good. The rugged strength, the fearless manner of expressing his knowledge, born of a rich and varied experience, carries conviction with it.

It was about this time, having charge of the Infants' Home, that I attended a child, eighteen months old, with a typical case of malignant diphtheria, which had steadily progressed toward a fatal issue in the face of the usual treatment

as generally taught and employed. She was nearly in a moribund condition when I felt justified in resorting to the heroic treatment of calomel. Barely able to swallow, we succeeded in giving ten grains of calomel in water at the first dose, following with five grains every hour, with instructions to stop when a full free characteristic dejection occurred. It took eighty grains to reach such an effect; the child commenced to improve from the fourth dose, and made a splendid recovery; not the slightest ill effect followed. A little later on, a woman, about fifty-five years of age, weighing 200 pounds, was scratched on the first joint of the third finger of the left hand by a neighbor's child dying with malignant diphtheria, whom she endeavored to hold while the physician sprayed the throat. The child died in half an hour after. My patient experienced "a peculiar deathly sick feeling," which she could not account for. After washing and laying out the child she went home and took a bath; while in the tub the same peculiar "deathly feeling" passed over her, and she noticed that her extremities had a "bluish look," her finger was beginning to pain at the seat of the lesion. I was called and found her greatly prostrated, severe pain in finger with red line running up the arm, the seat of the lesion inflamed and painful. Already, within so short a time she experienced constriction and swelling of the throat. Believing I had a case of inoculated diphtheria, I placed her on iron and chlorate of potash with gargle. The next day I saw her, with Dr. R. G. Curtin, in consultation, when the advance had been most rapid and severe. Not only were the axillary, mammary, and post-cervical glands involved, with red lines running up a swollen arm from the now badly ulcerated finger-joint, but also the membrane had involved the throat and post-nares. Her neck was badly swollen, and she, breathing with difficulty, was bathed in a cold, clammy sweat, features pallid and pinched, a cyanotic condition becoming manifest—all this within thirty-six hours from the time of receiving the initial scratch. With a reliable trained nurse to rigidly carry out the instructions, we determined upon the calomel treat-

ment, basing a hope upon the experience of the case of the child I had last treated for diphtheria, as hereinbefore mentioned. We gave a scruple at the first dose, and ten grains every hour thereafter for thirty-five hours, when a copious dejection occurred; smaller ones had preceded, but not until 365 grains had been given did we get the characteristic action, then the calomel was stopped. She ejected from nose and mouth at intervals during the exhibition of the drug large pieces of membrane, although no gargle or spray was used. We had little hope of saving this woman up to the time she had taken fifteen doses, or 160 grains; but from that time on she steadily improved in strength and appearance.

About every three hours a mild solution of chlorate of potash was given during the treatment. Calomel was dusted over the initial lesion on the finger, which took on a healthy action. She made a splendid recovery, was only inconvenienced for a short time from the partial paralysis of the muscles of deglutition and impairment of the sense of touch in hands and feet. These symptoms rapidly disappeared under the use of faradization; there was not the slightest evidence of ptyalism or other mal-effect. The remarkable specific action of calomel in large doses was here magnificently exemplified.

On the strength of the experiences related I have ever since employed the calomel treatment in diphtheria, and my cases have been not a few. I have seen but three perish—one, an unruly ten-year-old lad, that would not take the medicine from a foolishly weak, fond mother, who would not have a nurse; and the other had a mother, but no nurse; she thought it "a shame to disturb the child to give it medicine when it was sleeping so quietly."

One other died after the diphtheritic symptoms had been mastered, but from what seemed to be a cerebral involvement, presumably meningeal, that evinced itself within forty-eight hours after the initial symptom. I am not prepared to say that smaller doses, oft repeated, would accomplish the desired result; I doubt it in such extreme cases as recited. And yet,

last summer at a mountain resort, I attended a boy, about eight years of age, with naso-pharyngeal diphtheria. The submaxillary and cervical glands were greatly engorged, giving promise of direful results, especially when I found he was just convalescing from typhoid fever. Fortunately, a good trained nurse was with the family. The strongest preparation of calomel I had with me was the one-quarter grain tablet triturates (with sugar of milk). One tablet was given every twenty minutes, day and night, when in forty-eight hours a favorable change was noticeable, although no characteristic action on the bowels had taken place. The nostrils were occluded by membrane, when it occurred to me to make an application of calomel in solution through the nostrils. In a tumblerful of water I dissolved about two hundred of the one-quarter grain calomel and sugar-of-milk triturates, ordering the nostrils to be syringed every two to three hours with the solution after being well agitated; the effect was marvellous. Inside of twenty-four hours from the commencement of this treatment the nostrils were comparatively clear of membrane, the breathing quite natural, and the bowels had acted freely. The whole aspect of the child had changed for the better. In this case, as in others, a marked general improvement immediately followed. These cases, unlike those convalescing from diphtheria after ordinary treatment, exhibited a noticeable freedom from the terrible enervation which so frequently ends in marked prostration or heart-failure.

It is not necessary to further cite instances in my experience to substantiate the claim I make as to the virtue of the calomel treatment in diphtheria. There are many points untouched that, if discussed, would still further prove the value of this curative agent. Believing, as I do, that all sore-throats, where the tonsils are involved and where false membrane exists, are in some degree related to diphtheria, I never hesitate to exhibit calomel in small doses at first, and by its action prove or disprove the diphtheritic tendency of the case. If the tenth of a grain given every hour, dry, upon the tongue, fails to act upon the bowels in any reasonable time, say in

from eight to twelve hours, I assume there is more than an ordinary condition existing, and strengthen the dose, or shorten the time between doses accordingly.

As to local applications. When there is extreme malignancy, I would employ a solution of calomel, as cited.

I have not found it necessary to use gargle or spray during the activity of the disease, or when employing the larger doses of calomel, sufficient of itself as a topical application. In children particularly, the exhaustion following the struggle that generally occurs with each effort does more harm than good.

(I believe that in diphtheria, as well as in scarlet fever, more damage has resulted from the use of gargles, sprays, or swabs than is generally recognized.)

In ordinary cases I frequently recommend diluted peroxide of hydrogen or listerin. Later on, a solution of chlorate of potash, iron and glycerin, as a gargle or spray, greatly strengthens and soothes the enfeebled membrane of the throat; also, given internally, during convalescence, it is most valuable.

In true diphtheria calomel is slow to act on the bowels, and herein lies its diagnostic value, if in doubt. The more severe the type the greater the quantity to be given.

I have spoken of the *characteristic dejection* to be secured, especially in the malignant type, before we should let up in the administration of the drug. It should be a green, copious, frothy discharge, resembling "frog spittle," such as may be seen in an old water-trough.

As to danger of ptyalism. There is no danger. So long as it has the bacilli to antagonize, that alone seems to demand all its energy; and when it has conquered, it leaves in the characteristic evacuation described, and the patient is *absolutely free from any mal-effect.* I have never yet seen a case of diphtheria salivated by calomel in large or small doses, nor have I seen it create hypercatharsis in any case of diphtheria.

I am not unmindful of the potency of this drug, and I

certainly would not recommend its heroic use without proper discernment and without good, intelligent, reliable nursing. Sleep too often means death in these cases, and the wakefulness necessary in the frequent administration of the medicine will do only good to the patient and reward the nurse, for from twenty-four to forty-eight hours generally determines the issue.

Personally, I am satisfied with calomel in the treatment of diphtheria; I cannot conceive of any treatment safer or whereby better results might be obtained.

DISCUSSION.

Dr. Newton: In reference to Dr. Judd's paper, I wish to say that in his dependence upon calomel he greatly resembles a friend of mine who is a physician in Orange, New Jersey. This doctor does not fear diphtheria, and claims that he has never lost a case of that disease. He also continues the use of the drug until he obtains the green, frothy discharges described by Dr. Judd. He insists that the calomel be given early in the disease. He gives three grains every hour, dry, on the tongue. Some three years ago my little son, aged about five years, contracted diphtheria of a severe type. I was so much impressed by the severity of the symptoms that I sent at once for Dr. Love; but pending his arrival I gave the boy probably thirty grains of calomel in divided doses. Before the doctor came the child had changed for the better. Although he was subsequently very sick, he made a good recovery.

Dr. Brannan: I have been much interested in Dr. Judd's paper, and should be inclined to try his method of treatment at the first opportunity. I meet with but little diphtheria in private practice, but during the past four years I have seen some two or three thousand cases in the Willard Parker Hospital in New York, and my experience with calomel differs in some respects from that of Dr. Judd. In the first place Dr. Judd stated that he had found calomel an aid in the diagnosis of diphtheria, because of the slowness with which it produces catharsis in that disease. In the Willard Parker Hospital it is the routine practice to give each patient small doses of calomel, repeated every hour or two, until the bowels are well opened. The results of this treatment are all that could be desired, and we are never obliged to resort to other laxatives.

In the second place, Dr. Judd said that he had never seen any hurtful or depressing effects from the large amounts of calomel he is accustomed to give. Here, again, our experience conflicts with his. It was the custom at one time in the hospital, previous to the introduction of antitoxin, to employ calomel sublimates for the relief of laryngeal stenosis. The stenosis was often apparently relieved, but it was noted that the patients were afterward markedly anæmic. In fact, in passing through the convalescent wards, it was possible to pick out by their pallor those patients that had been subjected to fumigation. It is true that the calomel was not administered in the manner followed by Dr. Judd; but, in both cases the specific effect of the drug was sought and obtained, and I should think that the harmful results would also be the same.

Dr. Babcock: I should like to ask whether the fact that anæmia was produced by this drug is not explained by the fact that it was administered by the mouth.

Dr. Judd: I have nothing further to say in conclusion than this: I have never noticed anæmia as a pronounced symptom or sequela. I have never tried fumigation, nor, in fact, any other mode of administering calomel, other than by the mouth and in the various doses mentioned in my paper. I do not believe that the administration of calomel by fumigation could be nearly so effective as by the mouth; the topical action would not be so emphatic, which, in my opinion, is so very important. I believe fumigation would more likely produce disastrous blood changes.

Although I have not kept a systematic record of all cases, I have, on going over my books and, as memory recalls, from my own practice and those treated in consultation, tabulated twenty-three cases of the most malignant type and forty-two of pronouncedly severe cases, independent of a much larger number which might be called mild cases of diphtheria.

As stated, of the entire number I have only known three to perish, and two of these were undoubtedly due to bad nursing. I therefore cannot conceive of any treatment more successful or of any whereby effects are so easily controlled by the physician. Again, I lay the greatest stress upon faithful, intelligent nursing.

THE TREATMENT OF GOUT BY NATURAL MINERAL WATERS.

By CHARLES C. RANSOM, M.D.,
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In studying the literature of gout one cannot but feel how sad a commentary on the progress of medical science is the fact that the theories as to the causation of gout held by the ancient Greek writers, even as early as Hippocrates, three hundred and fifty years before the Christian era, were quite as reasonable and susceptible of proof as are those of the present day.

Hippocrates considered the disease due to the retention of *humors* in the system, and advised purging and the application of cooling lotions or cold water. Substitute the name uric acid for humors, and you have the most modern theory and treatment of to-day.

Following Hippocrates various ancient writers, such as Galen, Seneca, Aretaeus, Caelius Aurelianus, and others, showed their keen powers of observation in studying disease by ascribing to the growing luxurious modes of living the production of the gouty condition.

While we also are cognizant of the fact that luxurious habits, lack of exercise, and excesses are predisposing factors in the causation of the gouty condition, we are as ignorant as they as to the true nature of the *materies morbi*, and must perforce say with Aretaeus the Cappadocian, "None but the gods can truly understand it."

Notwithstanding the fact that a diversity of opinion exists as to the true nature of the affection, nearly all writers are

unanimous as to the predisposing factors, and there is consequently not so great a difference in the objects sought by treatment as one might naturally expect.

To stimulate functional activity, and thereby increase metabolism and the excretion of morbific matters, and to correct vices of living, must be our aim in the treatment of this disease.

It will be readily seen how a sojourn at a properly selected watering-place meets all these requirements. The choice of such a place is very largely a matter of personal opinion with the physician, and the different classes of waters have their various advocates.

There are many things to be considered in the selection of a watering-place for gouty patients. As a rule, such patients are nervous and irritable, and need a pleasant environment where they can be occupied and diverted and lead an out-of-door life, while their treatment is made a pleasure rather than a drudgery. The fact must also be borne in mind that results of treatment may be obtained from the hydrotherapic standpoint alone, irrespective of the mineral ingredients contained in the water used. The analysis of the water is, therefore, not alone sufficient in the selection of such a place, for unless the facilities for administering the waters are adequate, and the details of the bathing procedure are carefully carried out, the treatment, instead of doing good, may be productive of serious ills. While I believe thoroughly in the internal administration of mineral waters, as will be seen later, to my mind the most valuable mineral waters in the treatment of this disease are those that are used externally in the form of baths.

It is hardly conceivable that the chemical ingredients of most natural mineral waters are held in them in sufficient quantity to produce *per se* any marked curative effects upon the economy when taken internally. This is especially true of the alkaline mineral waters, the principle of whose action is to render alkaline the blood and the secretions. I do not wish to be understood as altogether decrying the use of alkaline waters. I believe that they have some value in augmenting the secretions and stimulating functional activity,

but I do not believe that they alone should be depended upon to effect a cure, but should only be used as an adjunct to the bath treatment.

As my experience with the mineral baths has been especially in the use of the waters of Richfield Springs, which are sulphur waters, I naturally feel that this class of waters is unsurpassed in the treatment of the gouty diathesis, and I may be justified in my opinion by the most excellent results which I have obtained from their use—results which, so far as I can learn, have not been surpassed at any springs.

In considering the treatment of gout by natural mineral waters I shall simply relate my personal experience gained from the observation of a great many cases which have come under my care during the past ten years at Richfield, and give you briefly a *résumé* of the methods which I employ in the application of these waters. The form of bath which we are in the habit of using in this class of cases at Richfield, and which seems to answer best, is the immersion or tub bath. The dose of the bath, if I may be permitted the expression, is regulated by its temperature and duration. The temperature and duration will be found to vary with different subjects from 96° to 108° F. for the former and from 5 to 15 minutes for the latter. The object sought in the application of the bath is to give such a bath as will produce to the fullest extent the physiological effect without exceeding it, for then depression will be sure to follow, and harm may result.

In determining the proper dosage much care must be exercised, for different patients vary very much in their reaction to the bath ; and it will also be observed that the same individual will vary at different times.

A large experience then is necessary to conduct properly the bathing procedure, and careful and frequent observation of the patient must be had. We usually begin with a bath at a temperature of 98° F. and duration of eight minutes, followed by complete rest of an hour in bed. This bath is taken three days in succession, and preferably in the forenoon, two and one-half hours after a light breakfast. After the

third bath the patient reports, and we note carefully the effects of the bath as seen by the sensations of the patient during and immediately after the bath: Whether or not there is depression or fatigue, whether there is exhilaration, how long, these sensations last after the bath, if after the rest in bed following the bath there is any fatigue or depression, if there is a sensation of fulness in the head or oppression of breathing during the bath, excessive perspiration following the bath, etc. From these subjective symptoms and careful physical examination of the patient we determine whether it is wise to increase or diminish the dosage, or to continue it as we have begun. These observations must be made every three or four days throughout the entire course of treatment, in order to insure the best results.

It is the custom of some physicians in all cases in which the baths are found to be depressing to order the bath every second or third day instead of modifying it. To my mind, this is very bad practice. If a bath is so depressing that a patient can take it only once in three days without ill effects following, it is never a proper bath for that patient. The bath should be modified by lowering the temperature and shortening its duration, and it is exceedingly rare that a bath cannot be properly adapted by these means. A bath at 96° F. for five minutes or even less will often accomplish everything desired, although to some it may hardly seem to be worth the while.

It will be found that nearly all patients taking a course of baths will suffer from a general systemic disturbance usually within the first week. The symptoms manifested in this condition are those of general malaise, headache, anorexia with coated tongue, and either constipation or a slight diarrhœa.

This is the condition described by writers on balneology as the "bath fever," and shows to the most skeptical that the medicinal bath is not a simple washing process, but is capable of producing as marked systemic effects as the ingestion of a drug.

At this time I omit the bath for a day or two. This

together with the administration of a little calomel always suffices to correct the condition. From this time on, during the entire course, it is rarely necessary again to interrupt the bath. The course of baths usually consists of twenty-one, but this number is not arbitrary, and frequently it is desirable to give more, though less than twenty-one is not enough to produce good results.

As I have already said above, I believe thoroughly in the internal use of water in connection with the baths, and it is my practice at Richfield to order the drinking of considerable quantities of water during the day. Free administration of a chemically indifferent water at proper periods diminishes the formation of uric acid and increases the secretions. The most potent agent in the internal use of mineral waters is the fluid, a property which is common to them all, and I, therefore, lay no particular stress with my patients upon the kind of water used. I usually order six glasses of water to be taken at stated intervals during the day. I often find it of advantage to prescribe some of the water hot. This is particularly the case with those who suffer much from indigestion. In these cases three of the six glasses are taken hot, one before each meal, not less than an hour before, and the stomach is thereby better prepared for the meal which is to follow, and in many instances the discomfort after eating is quite removed.

Next to the bath, regular and systematic exercise is of great importance in this condition. When it is possible active exercise out of doors in gradual and increasing amount is ordered. The various forms in which exercise may be taken is a matter of choice with the individual, but let it be borne in mind that if, for instance, walking is the form chosen, a short, brisk walk of even five minutes is of far more value than a half hour's slow and indifferent stroll. Bicycling, horseback riding, golfing, and various other sports which carry with them a considerable amount of out-of-door exercise are encouraged.

In conjunction with active exercise or without it in those cases in which active exercise would entail too much fatigue,

passive exercise is ordered in the form of massage or Swedish movements. Special forms of massage are adapted to those cases in which deformities and the like exist.

Diet is another most important element in the treatment of the gouty condition, and in no part of the treatment does individualism play so important a *rôle*. The fundamental principle in dieting this class of patients is to build up and invigorate the perverted nerve-centres, increase functional activity and thus bring nearer to the standard of health the nutritive and metabolic changes. The needs of each individual, then, must be carefully studied, and while some restrictions should be placed upon them in regard to certain classes of foods, a so-called low diet will be found in many instances to be most pernicious, and our best results will follow a generous plan of feeding.

At Richfield patients are allowed red meats and all others with the exception of veal and fresh pork, at least once a day, and twice if desired. Potatoes and the vegetables that grow under ground are prohibited, as well as the use of sweets. Breadstuffs are somewhat restricted, but butter and other fats are allowed. As to beverages, malt liquors and sweet wines are forbidden absolutely. If patients are in the habit of taking wine, and their condition needs a stimulant, there is no objection to a light wine, or, better still, Scotch whiskey with soda.

In conclusion, I wish to say that in presenting this paper to you I have not attempted to tell you anything especially new in regard to the treatment of the gouty, but have endeavored to emphasize the importance of the proper administration of medicinal baths in this connection, and to make more clear to those of you who have not had the opportunity of observing this form of treatment, the *rationale* of the bath.

DISCUSSION.

Dr. Babcock: Regarding the fact that in gout the foot is recommended to be kept quiet, especially in acute cases, I may say that I feel satisfied that I walked off an attack of that kind.

Dr. Newton: The treatment of many acute and chronic diseases by bathing, massage, and graduated exercises, is only beginning to take its proper place in modern therapeutics. As was wittily said of some physician who had said that he was thankful that he knew nothing of obstetrics, that if he was thankful for his ignorance, he certainly had a great deal to be thankful for. So it may be said of many modern physicians, if they were so foolish as to be thankful for their ignorance of balneology they would surely have much to be thankful for. An immense debt of gratitude is due the brothers Schott, who have demonstrated the value of bathing, massage, and exercise in heart disease, as well as to the already famous Brand, whose method of treating typhoid is so well known. I think that if anything has been demonstrated as to the value of baths and massage it is that they promote metabolism and elimination. They directly strengthen the heart, most probably by the removal of toxins from the system.

There seems to be every reason to believe that the benefits of this method of treatment may be definitely extended. Of course, in rheumatism and gout the benefits of proper baths have been known for many years. But for all that, I doubt whether they are appreciated or used one-thousandth part as often as they should be.

Gout, we might say, is the disease of deficient or perverted metabolism *par excellence*, and I see no reason to doubt Dr. Babcock's explanation that he walked off, or, perhaps we might say, sweat out, or eliminated from his system by exercise, the uric acid or other poisonous or excrementitious matter that was about to set up an attack of gout.

In private practice it is very difficult to get people properly bathed. They must go to some spa or fashionable watering-place. The domestic bath-tub like many other things near at hand, is not sufficiently appreciated. However, the laity are more on the alert for treatment without the use of drugs than they ever were before. And we could doubtless more often than we now do, induce our patients to undergo a course of bathing at home, as well as the courses of massage and graduated exercises which are fortunately becoming fashionable.

Dr. Walker: I am convinced of the truth of these statements made by Dr. Ransom as regards his views upon the efficiency of the

baths at Richfield. The advantage Richfield has over most American watering-places is the care of an efficient physician, who knows how to administer the waters and who has the latest methods for this purpose.

The so-called "bath fever" is no doubt due to the precipitation into the blood of the uric acid products from their numerous storing places throughout the economy.

Dr. Newton: It is my opinion that in typhoid fever a little bit of shock does good, but that a great deal does harm. As for example, a little change in the patient's surroundings, such as putting him in another bed, or moving his bed into another room, is often very beneficial, but moving him for any considerable distance is almost certain death. In other words, shock is a relative term. Change, exercise, warmth or cold, in moderation, will stimulate a patient; in excess it will shock him. Unfortunately, in many diseases like typhoid, in which the nervous system is already profoundly depressed, the danger-line is easily passed, and our efforts to stimulate may be excessive, and we may unintentionally bring on a state of shock and do more harm than good.

Dr. Ransom: I do not think that it is possible to use this form of treatment when there is high temperature or acute inflammation. I believe that in subacute gout, where the pain is not great, exercise might be of service; but there is danger of stirring up the uric acid and producing an acute attack. As to Dr. Babcock's case, he did not have an acute attack, or he could not have walked about at all. The benefit obtained by patients sent away to springs for treatment is more on account of the out-of-door life which they live at these resorts than on account of any mineral ingredients contained in the water which they drink and in which they bathe. In gout the effect is more marked upon the system. This effect is more than a natural water would have caused, as I proved last year while making some experiments upon the application of the shock treatment. I found great difference in its effect upon the circulation.

One effect of this treatment is an entire change of the nutritive processes. In typhoid fever I found that I obtained a better effect from the use of the douche. The action in typhoid fever is through the sedative effect of the cold bath upon the nerve centres. If care is used in typhoid fever or any other disease-process, in giving this bath to the patient there is no danger of producing hemorrhage. In the treatment of neurasthenia I have found that in every instance in which I have used shock I have done harm. Some physicians think that the good effect of the bath comes from the shock; but, as I before remarked, harm was done in every instance in which this was produced. In giving the douche it should be tempered to the sensations of the patient. Each patient will be found to vary from the

others in regard to his impressions in this respect, and this fact should be taken into consideration. Not only will different patients vary from each other in this respect, but the same patient will vary at different times. For these reasons it is very wrong for us to prescribe a bath of a fixed temperature Latitude should be allowed, so that the attendant can temper the bath to suit the sensations of the patient, as the exercise and environment at a watering-place is quite as important as the treatment pursued.

METEOROLOGICAL CONDITIONS OF SUNSTROKE.

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Sunstroke, insolation, heatstroke, and other more or less etiologically significant names are used to denote certain morbid phenomena which are generally understood to be produced or excited by heat, either natural or artificial. The word sunstroke is the one most frequently met with in both medical and popular literature, and for this reason will be generally adopted in this paper.

In order to avoid any misconception that might arise from the use of the term sunstroke as it is generally defined, it is necessary to state that throughout this paper it is used in a restricted sense, and has reference only to sunstroke as seen in temperate climates and to those cases that are apparently excited by abnormal meteorological conditions. Those cases that are due to artificial heat, such as the heated atmosphere of boiler-rooms and the like, although pathologically identical with those produced by general atmospheric conditions, cannot properly be considered as coming within the purview of this paper; but in dealing with very extensive collections of statistics it will not be found practicable to exclude all such cases from those dependent upon the general condition of the weather. It seems also necessary to acknowledge that the line of demarcation cannot be sharply drawn between sunstrokes of purely meteorological causation and those of partly or purely artificial origin. Undoubtedly many cases of sunstroke have their inception in local sur-

roundings, but become manifest as such after removal from the primary excitant—*e. g.*, a man working in a hot furnace-room may, after leaving it apparently well, be overcome under atmospheric conditions but slightly abnormal. Cases of this and of other sorts, which will doubtless immediately suggest themselves to you, render the study of the meteorological aspect of sunstroke very difficult and perplexing.

It seems that, in order to reach any trustworthy opinion as to the meteorological conditions influencing or producing sunstroke, it is necessary to assume some arbitrary basis or standard as to what shall constitute the presumption that the weather was the principal etiologic factor in originating the case in question.

In arriving at the conclusions to which it is the purpose of this paper to invite your attention, the author has assumed, as the necessary presumptive evidence of meteorological influence, the coincidence of the following conditions, viz.: that (*a*) the weather must be noticeably abnormal in some particular, (*b*) the number of sunstrokes must be sufficiently great to attract public attention, (*c*) the sunstrokes must not be confined to any particular class, trade, or occupation, or to the occupants of any one shop, office, or other structure, and (*d*) they must not be confined to a particular spot, but must occur throughout the locality subjected to the abnormal weather. Although it may not be strictly correct to use the term epidemic in connection with sunstroke, yet when the conditions just enumerated are complied with the writer will, in order to facilitate reference, speak of such compliance as constituting an epidemic of sunstroke. If this explanation regarding the use of the term epidemic be kept in mind, no confusion or misunderstanding will occur.

It will, perhaps, not be out of place to close this introduction by a brief statement of the generally accepted doctrine concerning the meteorological causation of sunstroke. The following appear to be the chief points of agreement among modern writers:

The sole efficient cause of sunstroke is heat, either as the

result of direct exposure to the sun's rays or to a high atmospheric temperature in the shade.

The particular degree of atmospheric temperature that may be considered one of great danger is difficult to fix because of the great tolerance of heat by persons in perfect health.

The action of heat is much influenced by the hygrometric condition of the atmosphere. A dry, hot air, it is claimed, is better tolerated than a moist one at a lower temperature, because it favors perspiration, and thereby keeps the body cool, while damp air diminishes evaporation and the refrigerating processes of the body.

Impure air is an important factor, as are also personal hygienic conditions and surroundings.

The injurious effects of heat are primarily exerted upon the nervous system.

In opposition to the importance of high relative humidity has been placed the rare occurrence of sunstroke at sea, the cases recorded having been stated to have occurred generally at night and between decks where the ventilation was extremely bad.

The special purpose of this paper is to call attention to certain facts discovered in the course of an investigation of the sunstroke epidemic of August, 1896, and to certain conclusions that seemed warranted by the facts disclosed. This investigation was made by the direction of the chief of the Weather Bureau, and the facts ascertained thereby were published in a paper contributed to the *Monthly Weather Review* for November, 1896, of which the following is a synopsis :

During the first part of August, 1896, there prevailed over a large part of the United States an exceptionally severe and prolonged period of hot weather, and during the same period there occurred a great many cases of sunstroke. This hot weather and the coincident sunstrokes were particularly severe in the Middle Atlantic and Central States. In response to a circular sent out by the Weather Bureau, information was obtained of 2038 deaths from sunstroke; 1817 of these were reported by the health officials of the localities in which they

occurred, and the remainder were obtained from what seemed fairly trustworthy sources. The cities of Boston, New York, Brooklyn, Philadelphia, Baltimore, and Washington furnished a total of 1461, and St. Louis and Chicago a total of 310 deaths. In addition to the number of deaths from sunstroke, there were obtained from a number of hospitals and physicians more or less complete histories of 841 cases of sunstroke. A comparison of the meteorological and sunstroke statistics showed that: (*a*) The number of sunstrokes was greatest from August 9th to August 12th. (*b*) The daily mean temperatures were highest during the same period, and were from 10° to 13° above the normal for the month of August. (*c*) The absolute humidity was at its maximum during these four days. (*d*) The relative humidity was above the normal in the Central States and below the normal in the Middle Atlantic States. The other recorded meteorologic conditions—*i. e.*, pressure, wind, rain, and state of weather—did not show any features that could be regarded as significant.

These facts seemed to warrant the following conclusions: (*a*) That the number of sunstrokes follows more closely the excess of the temperature above the normal than it does that of any other meteorologic condition. (See Tables A and C, and diagram.) (*b*) That the number of sunstrokes does not appear to sustain any specific relation to the relative humidity, the maximum having occurred in one region with a relative humidity above the average, and in the other region with a relative humidity decidedly below the average. (See Tables A, B, and D, and diagram.) (*c*) That, although the absolute humidity was greatest during the maximum of sunstrokes, yet it does not appear that its variations influenced the number of cases. (See Table E.)

The only conclusion enunciated that above conflicts strongly with accepted ideas is that regarding the influence of relative humidity of the atmosphere.

Inasmuch as the course of the temperature was the meteorologic condition that appeared most intimately associated with the increase and decrease in the number of sunstrokes, the

attempt was made to determine what degree of atmospheric temperature was necessary or likely to give origin to sunstroke. It was noticed that sunstrokes were reported in Boston when the average temperature of the day reached 82°, or 13° above the August normal. On the other hand, it was observed that the normal August temperature for New Orleans was 82°, and that, too, without any sunstrokes. Therefore, it was evident that sunstrokes were not excited by the same degree of temperature in every locality; and, for reasons not necessary to enumerate, it was assumed that each particular locality had for its native or acclimated inhabitants a special local sunstroke temperature or range of temperature. The next step, therefore, was to ascertain, if possible, whether this particular local temperature, or climatic sunstroke temperature, as it may be called, was capable of expression as a climatological function. With this object in view, a careful examination of the temperatures prevalent during the sunstroke period appeared to show that there was empirical evidence for adopting as a provisional index to the sunstroke temperature of each climate its normal daily maximum temperature. Applying this provisional standard to the cases of sunstroke as reported in the cities of New York, Boston, Philadelphia, and Washington, the following results were obtained:

In New York City 96 per cent. of the cases occurred with daily mean temperatures equal or nearly equal to the normal maximum temperature for August, the period in question. In Boston and Philadelphia 91 per cent., and in Washington 77 per cent. of the cases occurred under like conditions of temperature. In the light of these results, the following working hypothesis was proposed:

Sunstroke becomes imminent during the summer months when the mean temperature of any one day or of several consecutive days becomes equal or nearly equal to the normal maximum temperature for the period.

In order that the Association may judge as to the validity of the foregoing conclusions and hypothesis, the statistics

upon which they were based are submitted in the appended tables.

Inasmuch as the foregoing facts and conclusions seem resolvable into the generally accepted proposition that heat is the sole efficient cause of sunstroke, the chief point of interest centres in determining what degree of atmospheric temperature is likely to produce in a given community an epidemic of sunstroke. I think we may safely assume that while humidity, relative and absolute, wind, and atmospheric pressure may, under special conditions, be very important to a particular individual, they are as causative factors of sunstroke as a widespread event or epidemic obscured, and sink into insignificance in comparison with the overwhelming effect of high atmospheric temperature or intense direct insolation.

Taking this view of the subject, I have endeavored to find, by using such statistics for other years as were accessible, how far the hypothesis stated could be depended upon as a criterion of impending danger from sunstroke, with the result that it appears to be a fairly good index for the eastern and central parts of the United States. But it is to be remembered that, although it embodies certain plausible climatological considerations, it was evolved simply as an empiricism based upon quite a large number of events, and that it does not rest upon a satisfactory knowledge of all the factors involved.

As a matter of possible interest, it may be stated that the fatality among the 841 cases previously referred to as reported by hospitals and physicians was 16.6 per cent., 140 cases having terminated fatally. It may also be interesting to state what appeared to be the influence of alcoholic beverages in determining both the incidence and fatality of the affection. Of the 841 cases the history of 465 as to the use of alcoholic drinks is given as follows:

Using to excess	140	cases, or 30	per cent.
" moderately	230	" 50	"
" not at all	95	" 20	"
Total	465	" 100	"
History unknown	376		
Total	841		

and of the 140 deaths that occurred the history of 70 is given as follows:

Using to excess	41 deaths, or 60 per cent.		
" moderately	22	"	30 "
" not at all.	7	"	10 "
Total	70	"	100 "
History unknown	70		
Total	140		

TABLE A.—THE DAILY NUMBER OF CASES OF SUNSTROKE ADMITTED TO CERTAIN HOSPITALS OR TREATED IN THE PRACTICE OF CERTAIN PHYSICIANS FROM AUGUST 1 TO 20, 1896, INCLUSIVE, TOGETHER WITH THE RESULTING MORTALITY.

Places.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total cases.	No. of deaths.	Authority (hospital or physician).
Manchester, N. H.	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	1	Elliott Hospital.
Albany, N. Y.	...	...	...	...	...	...	...	1	...	4	5	5	...	...	...	...	...	...	...	...	15	3	Albany Hospital,
Rochester, N. Y.	...	...	...	...	...	...	...	2	...	...	...	...	...	1	2	...	...	...	...	...	5	...	Homœopathic Hospital.
Boston, Mass.	...	...	...	...	...	...	...	...	...	4	8	18	2	...	...	1	...	...	...	...	32	8	Boston City Hospital.
New Haven, Conn.	...	...	...	...	...	...	...	...	...	2	2	4	7	3	2	...	...	...	...	...	20	2	New Haven Hospital.
New York, N. Y.	...	...	...	2	3	9	5	12	15	49	78	106	64	9	5	...	...	...	...	...	357	62	Hudson Street, Roosevelt, and New York hospitals.
Brooklyn, N. Y.	...	...	...	...	...	2	4	8	5	11	26	32	11	2	2	...	...	...	...	...	103	22	St. John's, St. Mary's, and Brooklyn hospitals.
New Brunswick, N. J.	...	...	...	...	...	1	...	...	1	...	3	...	...	...	...	...	...	...	...	...	5	2	Drs. Williamson and Smith.
Philadelphia, Pa.	...	...	...	...	1	9	11	13	8	22	30	34	21	13	2	...	...	...	...	...	164	16	St. Agnes', Episc., Med.-Chir., and Hahn'n hosps.
Washington, D. C.	...	...	...	...	1	1	2	3	2	5	1	3	2	...	1	1	...	...	...	...	22	7	United States Government Hospital for Insane, Garfield, Providence, and Freedman hospitals.
Middle Atlantic States	...	...	...	2	5	22	22	39	31	97	154	202	107	28	14	2	...	...	...	...			
Pittsburg, Pa.	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	2	2	S. S. Hospitals.
Cincinnati, Ohio	...	...	3	2	2	4	2	8	4	9	7	...	1	2	3	...		...	1	...	48	5	U.S. Marine Hosp., St. Mary's, and Cincinnati hosps.
Columbus, Ohio	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	2	...	St. Francis' Hospital.
Cleveland, Ohio	...	...	...	...	...	...	...	...	4	4	1	...	...	...	...	...	...	...	...	...	9	2	St. Alexis', St. John's, and Huron Street hospitals.
Detroit, Mich.	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	2	...	United States Marine Hospital.
Holland, Mich.	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	Dr. Henry Kremeis.
Chicago, Ill.	...	...	...	2	1	1	1	6	3	1	1	...	...	2	1	...	...	...	...	...	19	4	St. Luke's, Mercy, and Michael Reese hospitals.
Springfield, Ill.	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	2	...	City Physician, Wabash Emp. Hospital.
Louisville, Ky.	...	...	2	1	...	3	1	...	2	...	...	...	...	...	...	...	...	...	...	...	9	...	City Hospital.
Cairo, Ill.	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	Dr. W. F. Grimsted.
Hannibal, Mo.	...	...	...	1	...	...	3	...	...	...	...	1	...	...	...	...	...	...	...	...	5	1	Drs. R. H. Godin, S. Q. Smith, P. L. Kabler.
Columbia, Mo.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	Dr. W. A. Norris.
Kansas City, Mo.	...	...	...	...	...	1	...	...	2	...	...	...	...	1	...	...	...	...	...	...	4	1	Drs. W. S. Wheeler, L. A. Berger, C. L. Hall.
Des Moines, Iowa	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	...	Dr. F. L. Wells.
St. Paul, Minn.	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2	1	City and County Hospital.
Central States	...	...	6	7	4	9	8	16	17	15	11	2	1	6	5	...	...	...	1	1			
Raleigh, N. C.	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	Rex Hospital.
Charleston, S. C.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	City Hospital.
Mobile, Ala.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	Dr. J. A. Abrahams.
Dallas Tex.	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	3	...	Parkland Hospital,
Palestine, Tex.	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	Dr. J. M. Colley.
Grand total	1	...	6	10	9	31	30	56	48	112	166	204	108	34	19	2	...	1	1	3	841	140	

TABLE B.—THE DAILY NUMBER OF DEATHS FROM SUNSTROKE OCCURRING IN CERTAIN REGIONS BETWEEN AUGUST 1 AND 20, 1896, INCLUSIVE.

Places.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Authority.
Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, Maryland, District of Columbia, and Virginia.	...	...	...	...	4	11	11	28	107	201	274	264	108	37	5	4	...	2	1	1	Newspaper clippings, health officers' reports, special reports, physicians, and others. (The information from which this table is compiled is far from complete.)
Ohio, Kentucky, Tennessee, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, and Oklahoma.	...	1	...	5	5	14	16	13	50	100	58	14	3	1	...	2	1	...	...	1	
Total	...	1	...	5	9	25	27	41	157	301	332	278	111	38	5	6	1	2	1	2	

TABLE C.—THE MEAN TEMPERATURE OF EACH DAY AT CERTAIN SELECTED STATIONS DURING THE SUNSTROKE EPIDEMIC OF AUGUST 3 TO 18, 1896, INCLUSIVE.

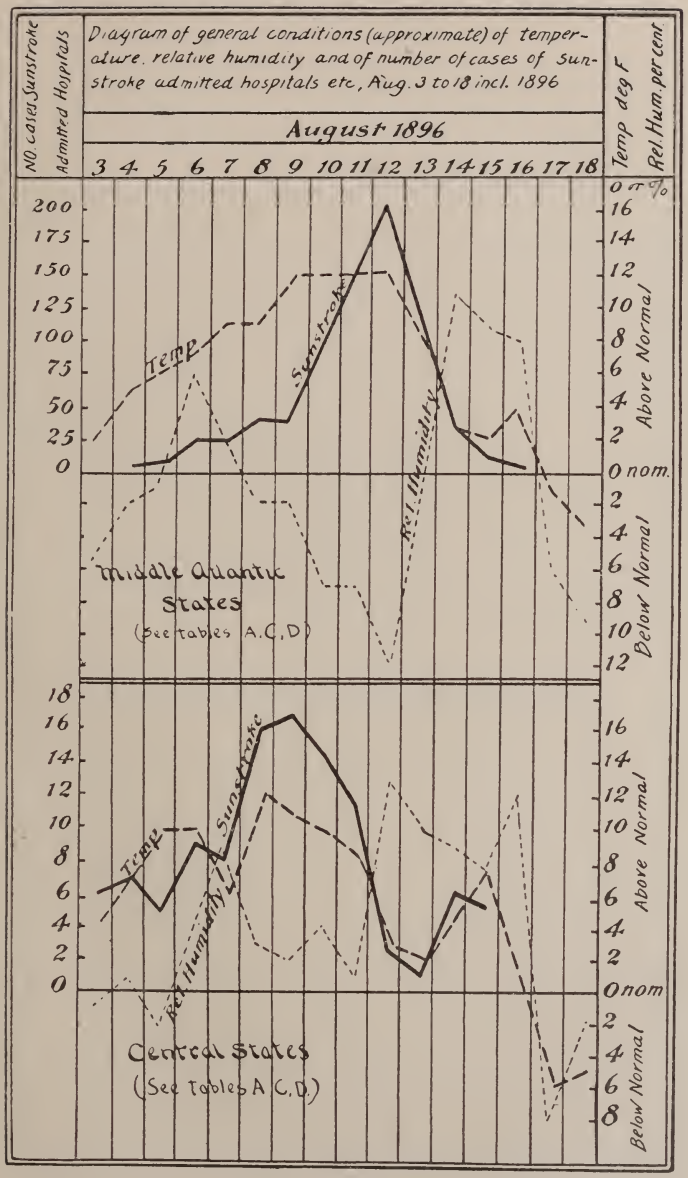
Places.	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Normal.	Normal Maximum.
Albany, N. Y.	72°	78°	82°	83°	82°	82°	82°	84°	83°	82°	77°	76°	75°	74°	69°	64°	71°	80°
Boston, Mass.	71	78	72	65	77	75	82	86	82	82	76	71	67	74	72	68	70	78
New Haven, Conn.	71	77	80	72	77	81	82	84	83	84	82	74	72	73	69	64	70	78
New York, N. Y.	74	77	80	82	80	82	82	84	85	84	81	75	74	73	68	65	73	80
Philadelphia, Pa	77	79	82	86	84	86	87	84	87	87	85	77	79	78	74	71	74	82
Washington, D. C.	78	80	83	88	87	84	87	84	84	86	82	78	77	79	73	71	75	84
Chicago, Ill.	77	82	84	79	77	87	83	86	81	73	72	78	76	72	68	65	71	78
St. Louis, Mo.	82	86	88	90	91	91	90	84	86	82	79	81	86	77	72	72	77	86
Cincinnati, Ohio	78	78	81	85	76	84	85	84	82	78	80	78	82	76	68	70	75	84
Charleston, S. C.	84	80	83	82	82	85	87	86	84	82	84	82	80	84	86	80	81	87
Jacksonville, Fla.	86	81	82	83	84	84	86	86	86	84	85	83	84	84	84	86	82	90
New Orleans, La.	82	86	86	84	84	81	78	82	82	86	84	82	80	82	85	87	82	88

TABLE D.—THE DEPARTURE OF THE DAILY RELATIVE HUMIDITY FROM THE NORMAL AT CERTAIN STATIONS FROM AUGUST 3 TO 18, 1896, INCLUSIVE.

Places.	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Normal.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Albany	0	+3	— 7	— 5	+ 9	+8	+4	— 4	— 3	— 5	+ 1	— 2	— 6	+ 8	—20	+ 5	76
Boston	— 2	—9	+ 3	+19	+ 9	—3	—1	— 5	—12	— 5	+ 1	+16	+14	+ 7	—15	—11	75
New Haven	— 1	—1	— 8	+15	+13	—3	—1	— 1	— 7	— 7	— 5	+15	+ 9	+ 1	— 9	—11	79
New York	0	+2	— 9	+12	+ 7	+4	+4	—10	— 4	—10	— 7	+17	+15	+12	+ 2	+10	74
Philadelphia	— 9	0	— 2	+ 2	+ 1	—3	—2	—12	—14	—20	— 6	+ 6	+ 8	+10	—30	—16	72
Washington	— 9	0	+ 4	— 8	— 7	—8	—7	— 8	— 6	—13	+12	+ 4	0	+ 2	—12	— 18	76
Chicago	— 3	—3	— 6	+12	+14	+1	+5	+ 7	— 1	+18	+16	+12	+ 6	+ 8	—14	— 8	68
St. Louis	+ 1	+4	— 1	— 9	— 3	—1	—7	+ 3	+ 3	+18	+ 9	+ 9	+11	+22	+19	+23	67
Cincinnati	— 1	+3	+ 1	+ 7	+15	+9	+7	+ 3	0	+ 4	+ 6	+ 5	+ 5	+ 7	—10	—10	65
Charleston	+ 4	+6	+ 2	0	— 1	+1	—5	— 3	— 1	+ 2	— 1	+ 1	0	— 1	+ 1	+ 4	82
Jacksonville	—13	+7	+ 3	— 1	— 3	—6	—8	—11	— 4	— 8	+ 3	— 5	— 1	— 3	— 7	— 3	81
New Orleans	— 2	+5	—11	— 5	— 1	0	+1	+ 3	— 9	—13	— 3	0	+ 3	0	— 7	— 6	79

TABLE E.—THE DAILY ABSOLUTE HUMIDITY (GRAINS PER CUB. FT.) AT CERTAIN STATIONS FROM AUGUST 3 TO 13, 1896, INCLUSIVE.

Places.	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Normal.
Boston	6.6	7.0	6.6	6.1	8.5	7.5	8.8	8.0	8.0	8.5	7.0	7.0	6.4	6.6	5.0	4.4	5.6
New York	6.6	7.5	7.7	8.5	8.5	8.5	9.4	8.0	8.8	8.0	7.5	8.0	7.5	8.0	5.6	5.2	6.1
Philadelphia	6.2	7.5	8.0	9.1	8.5	8.5	9.1	8.2	8.0	7.2	8.0	8.0	7.5	8.0	3.8	4.2	6.1
Washington	7.0	8.0	9.1	8.5	8.2	8.5	10.0	7.5	8.5	8.5	8.0	8.0	8.0	8.5	5.6	4.7	6.6
Chicago	6.4	7.2	7.5	8.0	8.5	8.5	9.4	8.8	8.0	7.5	7.2	7.5	6.8	6.1	4.9	4.1	5.4
St. Louis	7.5	8.8	9.1	8.5	9.1	9.4	8.5	8.5	9.1	8.5	8.0	8.2	8.5	8.5	7.5	7.5	6.1
Cincinnati	6.6	7.2	7.5	8.0	8.0	8.5	8.8	8.5	7.5	7.0	7.7	7.5	7.5	7.0	4.1	4.4	5.7
Charleston	8.8	9.6	9.6	9.1	9.4	9.6	9.1	9.6	9.6	9.6	9.1	9.6	9.1	9.4	9.4	9.1	8.8
Jacksonville	8.5	9.1	9.1	9.1	8.8	8.5	8.5	8.2	8.5	8.5	9.4	8.8	9.1	8.8	8.5	9.1	8.5
New Orleans	9.1	8.8	8.5	8.5	9.1	8.0	8.5	8.8	8.0	7.5	9.1	8.5	9.1	8.8	9.1	9.1	8.5


No. cases Sunstroke Admitted Hospitals
Diagram of general conditions (approximate) of temperature, relative humidity and of number of cases of Sunstroke admitted hospitals etc., Aug. 3 to 18 incl. 1896
August 1896
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Temp deg F
Rel. Hum. per cent
200 175 150 125 100 75 50 25 0
0 2 4 6 8 10 12 14 16
Above Normal
Temp
Sunstroke
Rel. Humidity
0 nom.
2 4 6 8 10 12
Below Normal
Middle Atlantic States
(See tables A.C.D)
18 16 14 12 10 8 6 4 2 0
Temp
Sunstroke
Rel. Humidity
Central States
(See tables A.C.D.)

DISCUSSION.

Dr. Babcock referred to various factors in the production of sunstroke, *e. g.*, the fact that the individual may be suffering from a circulatory disease, or that he cannot be dissociated from habits, not only of drinking alcohol, but of taking iced drinks.

Dr. Solly: I am surprised to learn from Dr. Phillips's table that there was an increase of sunstroke, with, at the same time, a decrease in the relative humidity. Sunstroke is certainly less common during hot weather in dry climates than in damp ones. I have personally observed this to be the case both in Egypt and in Colorado. Persons are occasionally prostrated by the direct burning rays of the sun, but sunstroke—that is, sun apoplexy—is practically unknown in these countries, while, on the other hand, in humid England it occurs not infrequently and at much lower temperatures than it does in the comparatively drier atmospheres of the United States. The influence of alcoholism in predisposing to sunstroke is evidenced by the fact that in England, where the laborers always drink freely of some form of alcoholic beverage during harvest, there are more sunstrokes in the districts where beer is used than where the weaker liquor of cider is consumed.

Dr. Brannan: Dr. Phillips's paper and charts are of great interest and value from a clinical as well as from a meteorological standpoint. They appeal to me with especial force, as I was in New York last summer throughout the hot period which he describes. Dr. Phillips considers that the high temperature was the chief factor in the great mortality of that time; it seems to me that we should rather say the *continuous* high temperature. Sunstrokes seldom occur unless the thermometer remains high for several days in succession. During the week of uninterrupted heat last summer the number of sunstrokes increased from day to day, but dropped at once to very low figures with the first fall in the temperature. Had we had one cool day in the middle of that week I believe that the sunstrokes would have practically ceased, and several days of hot weather would have been necessary before the number would have risen again to high figures.

I have spent the summer in New York for the past twelve years, and have noticed that two or three hot days are borne with tranquillity; but at the end of a week our power of resistance is so lessened that a feeling of desperation comes over one, and it seems impossible to bear the heat any longer. It is under such circumstances that men resort to stimulants, which operate to increase the hurtful effect of the temperature. The majority of the cases treated in Bellevue Hospital last summer had been taking some form of alcohol at the time they were struck down, and such cases usually resulted fatally.

Dr. Phillips: In reference to what Dr. Brannan said regarding continuous high temperature, I agree entirely with him. In speaking of the matter I meant to intimate that the atmospheric temperature must be high and continue high for some considerable period—two or more days at least—and I am very glad that he has called attention to this point, in order that it may be brought out prominently. The human body is so constituted that it can stand a very high degree of atmospheric temperature, provided the temperature be not of too long duration. Experimenters have endured for a few minutes, without appreciable ill effect, temperatures of about 260° F. Of course, if during this hot spell the temperature had dropped to nearly normal for even a day we should probably have had considerably fewer sunstrokes.

I have no doubt that many of the cases of sunstroke are the result of indulgence to excess in alcoholic drinks, and during very hot weather I think the use of alcohol as a beverage in any form is to be condemned, and this appears to be the opinion of all physicians that have observed or studied the subject of insolation.

Now, concerning the question of atmospheric humidity:

By absolute humidity is meant the real amount of water existing as vapor in a unit volume of air. This amount is, in English measures, usually stated as grains of water per cubic foot of air.

By relative humidity is meant the ratio that the amount of vapor actually present bears to the amount required to saturate the space at the given temperature. Relative humidity is usually stated as percentage.

The amount of vapor required to saturate a given space will depend upon the temperature. For example, a cubic foot of air at 50° F. will require for saturation 4.09 grains of vapor, and if we raise the temperature to 98° F. it will take 18.69 grains to effect saturation. Thus a cubic foot of air at 50° F. saturated with moisture would have a *relative humidity* of 100 per cent.; but if its temperature was raised to 98° F. it would have a *relative humidity* of only 22 per cent. Conversely, a cubic foot of air at 98° F., the *relative humidity* of which was 22 per cent., if cooled to 50° F., would have a *relative humidity* of 100 per cent. In both illustrations the actual weight of vapor or *absolute humidity* remains unchanged. Absolute humidity is a statement of a physical condition independent of any other conditions; whereas relative humidity is a statement of a relation that, to be rationally understood, requires that we shall know both the temperature and the absolute humidity. Relative humidity is not a meteorologic element; it is simply a questionable convenience, so far at least as medical climatology is concerned. The use of these two terms, relative and absolute humidity, is very apt to lead to confusion in the minds of those who meet them for the first time, and it seems to me that a new term might be introduced to describe one of these condi-

tions—that is, a term that would not likely be confused with the other.

In New York the absolute humidity on August 9th was 9.5 grains of moisture to the cubic foot; on the 12th it was only 9 grains. For some reason that I do not understand, it declined before the temperature. I did not illustrate the absolute humidity on the chart, but if we were to draw a line to indicate it it would about parallel the line that indicates the temperature, however, commencing to fall a little before that line does.

Concerning the influence of atmospheric humidity upon heat loss, the subject is yet one for us to determine. Moist air has greater capacity for heat than dry air at the same temperature; but how does this affect our comfort? If it imparts more heat to us, conversely it must abstract more heat from us. It is true that we feel heat or cold more acutely when the atmosphere is relatively damp; but may this not be caused by the effect of moisture upon cutaneous sensations in general rather than any real action of moisture as a thermolytic factor? A dry skin is not as appreciative to tactile sensations as a moist one. Of course, we can assume extreme cases of an atmosphere saturated with moisture at a temperature of the human body, and then there is no question of the effect of the humidity; but in nature we will not meet in this country with any instance approximating such a state of affairs. In the hottest weather the humidity will never be such that it will interfere with the evaporation of all the perspiration excreted under normal conditions of exercise and rest.

In regard to Dr. Babcock's remarks, I did not refer to iced drinks, because that aspect of the subject was not included in my statistical information. Of course, a great many people suffer from sunstroke because of weak circulatory systems or other diseased conditions rendering them unable to resist the occasional excessive high temperatures of our summers. Any habit or practice that tends to impair health would doubtless, in excessively hot weather, contribute to the incidence of sunstroke in the individual indulging therein.

During the hot weather of August there was one feature of the temperature with which I have since been struck, and which may be of considerable importance in the causation of sunstroke epidemics, that is, that during the prevalence of the epidemic the night temperatures did not fall below 75° F. I think this high night temperature had a particularly bad effect; if we could only have gotten a little relief for but a few hours of the night, perhaps we would have stood the high temperature of the day very much better and for a much longer time. This point has been emphasized in my estimation by the following facts:

Among the statistics that were gathered were accounts of about seventeen cases of sunstroke in Arizona and California (these facts

were furnished by the health officials of the different communities, and are authentic). Most of the cases occurred in July, 1896, during which month the Pacific and Rocky Mountain States suffered severely from a prolonged spell of hot weather. In Arizona and California temperatures of 108° and 110° F. were recorded during the day, and frequently the night temperatures did not fall below 75° F. It was upon these occasions that most of the above cases occurred. Therefore, I think in order to produce a sunstroke epidemic it is necessary that the night temperatures be high as well as the day temperatures. These considerations suggest, so far as the etiology of sunstroke is involved, the probable importance of diurnal temperature range, and the climatologic conditions that favor the same and which, perhaps, account for the relative infrequency of sunstroke in such climates as Colorado and Egypt, where, owing to the relative dryness of their atmospheres, there are very few clouds to interfere with terrestrial radiation, and as a consequence the temperature always falls very much after sunset. As an indirect agent in the climatologic distribution of sunstroke, humidity and its relation to temperature may thus be of great significance.

As Dr. Solly has remarked, there are two perhaps distinct causes of sunstroke—one, the effect of intense direct insolation, and the other the effect of high atmospheric temperature. I think the former variety rare, and the latter the more common in the temperate zones. What I have called sunstroke in this paper might with more propriety be denominated heatstroke, but I have used the former term because it is the more common.

A CLINICAL STUDY OF TACHYCARDIA AND ITS RELATION TO URÆMIA AND GRAVES' DISEASE.

By ROLAND G. CURTIN, M.D.,
PHILADELPHIA.

During the last three years I have had several cases sent to me which appeared to the attending physicians to be cases of simple irritable heart, in some of which the tachycardia was, however, only a prominent symptom. Dr. Sansom, of London, defines tachycardia to be a condition of the heart causing it to beat at the rate of ninety or more in a minute.

About two years ago I was called by Dr. John W. Dick to see a woman, thirty-five years of age, whose history was as follows: There was nothing unusual observed except that there was considerable anasarca during the last three months of pregnancy, and during the last two months she had an enormously voracious appetite. The labor was tedious. After vain efforts to deliver her instrumentally, version was resorted to, and with great difficulty a dead child was born. The woman had but recently come from a distant part of the country, and the doctor had had the opportunity of seeing her only twice prior to her confinement. Before labor there was no suppression of urine, nor were there any symptoms of uræmia. Examination failed to show the presence of albumin. After labor she was catheterized, but no urine was found in the bladder. I saw her two days after delivery, and learned that since twenty-four hours after labor her pulse had been 140. This tachycardia came on with the suppression of urine, associated with constant vomiting, and

continued with boulimia until death, which occurred sixty hours after delivery. Her skin and breath had a strong uriniferious odor, but there was no evidence of septicæmia. Her mind was perfectly clear, and there was no tendency to convulsions.

In this case the poison appeared to fasten itself upon one or more nerves of the heart, stimulating them to such a degree as to wear the organ out, causing death from exhaustion.

M. N., female, aged forty years, and the mother of four children. She had always been healthy, and nothing unusual occurred during her first three confinements. One year after she was delivered of her fourth child she came to Philadelphia, with the history of having had three convulsions before and one after an instrumental delivery. During the convulsions, which were very long and severe, she had marked albuminuria. After the first convulsion she was entirely unconscious. Bloodletting was not resorted to. Her face was puffy, and she had all the evidences of anæmia. During one of these severe convulsions it was noticed that there was an unusual pulsation at the root of the neck, in the region of the lower portion of the right common carotid artery, which has continued ever since. When under excitement she sometimes has a choking sensation, and during the last four weeks has had some dysphagia. Her heart has been rapid for the past year, running from 100 to 120. I examined her urine and found it to be free from albumin. The pulsating tumor in her neck proved to be an aneurismal dilatation of the right common carotid artery, extending from to about two inches above the clavicle. It is probable that one or more coats of the artery gave way during the stress of the severe eclampsia.

At the time she was placed under my care her pulse was 108. Her heart was found to be somewhat hypertrophied, but free from murmurs. I placed her in bed with a restricted diet, and gave her potassium iodide, 4 grains, and fluid extract of veratrum viride, gtt. ij, four times a day. In three weeks the heart was beating sixty-eight times in the minute, and the pulsation in the neck had wonderfully decreased. At

this time she became restless and left for her home. As soon as she arose from her bed and walked around her pulse ran up to about 80.

In this case the uræmic condition seemed to start the heart into rapid action, continuing till hypertrophy of the heart set in, which, with an excitable nervous condition of the system, and the too active life she was leading, continued the tachycardia after the subsidence of the albuminuria.

These two cases seem to have been first caused by a local toxic irritation of the nerves of the heart, rapid action following as the immediate result.

In other cases of uræmia I have noticed various isolated manifestations, such as headache, vertigo, vomiting, and nausea, and in one case under my care there seemed to be an excitation of the nerves of respiration, the only nervous symptom present being rapid, gasping breathing. No disease of the lungs or pleuræ was found after death.

I will now refer to a group of cases in which the rapid action of the heart, of a more or less constant character, was almost the only symptom—*i. e.*, cases of undeveloped Graves' disease. You all know that the first of the so-called three cardinal symptoms found in this disease is generally palpitation of the heart, associated usually, but not always, with a marked rapid action. I have completely tabulated fifty-five cases of Graves' disease, and find that palpitation was the first and for a time the only symptom that was noticed in thirty-four instances, and in some it was years before the other symptoms presented themselves. In a number of cases so tabulated the rapid action of the heart was first discovered by the attending physician, it being not at all perceptible to the patient.

I will first present to you the following histories, and will conclude with some general remarks concerning them.

I was asked by Dr. McDowell to examine a woman, thirty years of age and the mother of one child, to determine whether or not she had an aneurism of the abdominal aorta. I found considerable epigastric pulsation, but no other evi-

dence of aneurism. Upon further investigation I found that she had a morning temperature of 99° or more, and a pulse ranging from 104 to 116, the first sound of the heart murmurish and markedly softened and short. The character of these heart-sounds caused me to examine her thyroid gland, which I found to be slightly enlarged. I saw her two weeks later, and this enlargement had considerably increased. She had nervous tremors and was easily excited, but there was no suspicion of prominence of the eyeballs.

Another patient was sent to me from a limestone region in the interior of Pennsylvania as a case of simple irritable heart. She was thirty-four years of age and the mother of three children. Two months prior to her visit to me her heart became excited, the pulse ranging from 110 to 120. Her digestion was disordered, and she had the muscular tremors so common in Graves' disease. She was very excitable, and her doctor feared insanity, as there was a strong hereditary tendency in that direction. On examination I found a faint, soft, mitral systolic murmur and a considerable enlargement of the thyroid gland, which she told me had began to slowly increase in size between the ages of fifteen and sixteen, when her menses were first established. The right eye seemed a trifle more prominent than the left, but neither was markedly abnormal. I had seen two cases of Graves' disease who were related to her mother, and I found that there were four in her father's family also.

Mrs. E. H., the mother of three children. Between the ages of twelve and thirty-five years she had marked attacks of palpitation with tachycardia, which she called "heart bumps." She had a slight mitral, systolic murmur and an action of the heart that suggested to me Graves' disease. This suspicion was increased, as I knew that her mother and only sister had it unmistakably. I watched her for a number of years with great interest. At the age of thirty-five years one of her children sickened and died, which depressed her very greatly, and immediately following this her thyroid gland began to enlarge rapidly, and her eyes became promi-

nent. Prior to this she had tremors of the muscles, and was exceedingly nervous, and subsequently, when she was lying in a depressed, nervous condition, her heart became intermittent.

Mrs. F. C., aged forty-three years; no children. Her husband was an old syphilitic subject. There was no history of exophthalmic goitre in the family. For the past ten years she has had a sense of palpitation whenever disturbed, either emotionally or constitutionally. These attacks, accompanied with shortness of breath, would be felt principally when ascending stairs or moving about hurriedly. Seven years later, after an attack of influenza, during which there was a good deal of violent coughing, her thyroid gland began to enlarge, and she remained in this condition for two years. During the first year it was constantly varying in size, but lately it has not changed much, if any. She is anæmic, has muscular tremors, and is exceedingly nervous and excitable, but the eye symptoms are now negative. This last condition being absent does not shake my belief in its being an undeveloped case of Graves' disease.

The following case was in the wards of the Philadelphia Hospital in 1884. He was forty-three years of age, born in Ireland, and had followed the sea until two years ago, when he went to work in a stone quarry. In 1872 he was struck in the back of the head, and probably sustained a fracture of the skull, as a distinct depression could be felt at the seat of the blow. Last April, while being treated at the hospital for a fracture of the leg, he began to suffer from severe attacks of vomiting and palpitation, without any apparent cause. These attacks lasted till six months later, at which time he came under my care. He was a strong-looking man, somewhat inclined to corpulency. His respiration was rapid, and his face red and congested, although he was quite anæmic. His only comfortable position in bed was either on his face or back; any movement toward his right side gave him severe pain over his heart, and if he attempted to rest on his left side the palpitation was unbearable. The pulse was

rapid, ranging from 120 to 130 per minute; respiration 50 The tongue was small and covered with a slight white fur, and there was a slight enlargement of the thyroid gland. His digestion was very poor, and for months he had lived on a diet of boiled milk, being unable to retain anything else on his stomach. He had a pulsation in his epigastrium which was so marked that when I took charge of him he was labelled as a case of aneurism of the abdominal aorta. When standing he became dizzy and required support to keep himself from falling. After a careful examination I found that the abdominal aorta pulsated abnormally, but there was no evidence of its being dilated. The two sounds of the heart were very much alike, the first being greatly shortened. No cardiac murmur could be detected. The eyes were normal, and no enlargement of the thyroid was then present, but a few days later the gland became perceptibly enlarged and both eyes slightly prominent. Had he died before these symptoms presented themselves the case would probably never have been properly diagnosticated.

These samples have been culled from a large number of histories as more particularly illustrating rather unusual cases, in that they had the palpitation and excited heart long before the other symptoms appeared, and some of them were diagnosticated erroneously as simple essential tachycardia.

I also have the history of a case in which the pulse ran from 111 to 130, but the heart was free from murmurs. She was anæmic, had muscular tremors, prominent eyes, and was nervous and apprehensive.

This case illustrates the absence of thyroid enlargement—one of the triad of symptoms usually found in this affection.

Another case had, about puberty, nearly the same symptoms, the only difference being that she had the enlarged thyroid, while her heart was not particularly affected, showing no signs of palpitation for a long time.

In a paper read at the second Pan-American Medical Congress, held in the City of Mexico, in November, 1896, on "Heredity as a Primary Factor in Graves' Disease," I gave

statistics collected from thirty-five families in which ninety-seven cases had occurred. Since that time I have added four more families, making a total of 113 cases in thirty-nine families.

The value of heredity in the diagnosis of slowly developing cases of Graves' disease is very important to recognize, as taken in its early stage the disease is much more amenable to treatment than it is after having become chronic. This is well illustrated by the case of Mrs. E. H., reported in this paper. I suspected the true nature of her trouble years before its perfect development, owing entirely to the fact that I knew her mother and only sister had previously had unmistakable cases of exophthalmic goitre.

TABLE SHOWING THE SALIENT POINTS IN THE DIFFERENTIAL DIAGNOSIS OF THE TACHYCARDIA OF UNDEVELOPED GRAVES' DISEASE AND SIMPLE IRRITABLE HEART.

Undeveloped Graves' Disease.	*Simple Irritable Heart.*
Anæmia common.	Anæmia rarely if ever present.
Muscular tremors common.	Muscular tremors not common.
Fever generally accompanies each paroxysm of palpitation.	No fever with paroxysms.
Appears generally in weak, nervous women.	Oftenest in muscular men.
Rarely in tobacco users.	Commonest in tobacoo users.
Slight, soft, quick, systolic murmurs, or a murmurish sound at the mitral orifice.	No murmur.
Heart-sounds short and muffled.	Short, sharp tack-hammer sounds
Follows mental or other shocks.	Follows overwork or overstrain.
Graffe's sign may be present.	No such sign.
Prominence of one or both eyes.	Eyes congested sometimes; not prominent.
May have a soft, slightly enlarged thyroid, varying in size.	Thyroid unaffected.
Hereditary.	Not considered hereditary.

DISCUSSION.

DR. NEWTON: I was struck by the similarity of the cases described by Dr. Curtin and some cases of prolonged heat-strokes. We have not the time now to go into this matter, but it would be very interesting to do so. The irritable and unstable nervous system and weak, irregular, cardiac action are similar in the two conditions.

It has been found that a man in a hot bath can stand a very high temperature if the heat is not applied for too long at a time. After being exposed to this heat for some time the system establishes an artificial form, so the man will sweat if the temperature of the water is raised even a quarter of a degree and shiver if it is lowered to the same extent. I mention this fact to show the great adaptability of the nervous system. Man can gradually accustom himself to almost any temperature. We know that North Americans can endure a tropical temperature if they submit to the conditions of life observed by the people who live there; but they must be people with sound nervous systems and good heart action. In other words, they must have that elasticity which will enable them to endure change, and even considerable shock, without serious detriment to their bodily functions. I think, as I said before, that the condition of the system is similar after sunstroke to its condition in such cases as Dr. Curtin has described as undeveloped exophthalmic goitre. In his cases the resiliency of the nervous system had, for some reason, been lost. So after a shock or an injury or after certain diseases, as, for example, after diphtheria, the nervous mechanism is often thrown completely out of gear. It may recover its balance and the bodily functions go on as before, but such cases present, as a rule, very serious problems to the clinician.

Dr. Solly: I am sorry that there is not time to go into the subject at length. I cannot tell whether the nervous system is in fault in producing this disease or whether the climate is so; but in the twenty years that I have been in Colorado I have seen a number of cases of Graves' disease, and my general impression is that the climate there is not unfavorable. I have seen decided improvement in patients there, so I do not think patients must necessarily leave high altitude because of having this disease; but any undue exertion is more likely to affect them unfavorably there than at a low altitude. I have a case at present of a young woman who has chronic phthisis. Her case was not quite cured, but it was in arrest, when she took la grippe, which was followed by Graves' disease. Her pulse ran up to 130 and 140, and the exophthalmos was very marked. She had been overdoing the matter of exercise. I put her to bed, gave her calomel, digitalis, and iron. She is now up and taking moderate exercise. Her pulse is not excessive. The question arose of sending her away. Of course, if it becomes necessary I shall do so, even at the risk of making her chest worse.

Dr. Curtin: The subject of the climatic treatment of this disease was discussed seven years ago before this Society, at which time I read a paper upon "The Climatology of Graves' Disease," and it was then decided that a person would be more likely to have this disease at a high than at a low altitude.

I think that rest is more important than medicine. The fact that persons have a paroxysm from some cause which gradually passes away, no matter what we do, shows sufficiently that often the medicine used is of very little value. If the medicine is given and the patient improves, I do not think it is always due to the drugs, but to the gradual natural subsidence of the disease. In fact, I am satisfied that they sometimes get better in spite of the treatment. Quietants to the nervous and circulatory system with heart tonics do good and hasten relief, or even may cure with continued quietude of body and mind.

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